PERSONAL INFORMATION

INDEX

May Radhika.

Trauma

S. No.	Date	Title	Pg. No.	Remarks
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An oyster can take five years just to make one pearl.

DELTA STATIONERY

Traumatic Cataract

3 Mech

- Closed globe Injury
  - Dislocation C. formation
    - Vossius ring
      - Circular brown pigment seen on Ant Capsule
      - Striking of Contracted pupillary margin against C. Lens
      - ↓ size of pupil
    - Concussion Cataract
      - Imbibation of Aq
      - Direct Mech effect of Inj on lens fibres
        - Discrete Subepithelial Opacities
        - Late rosette C
        - Traumatic Zonular C
        - Diffuse Concussion C
        - Memb C.
    - Membranous C
- Open globe Injury
  - Perforating
  - Penetrating
    - Massive perforation
      - Release of free floating particles in AC
      - Become Cataractous
    - Perforating Inj
      - Opacification of Cortex at site of rupture
    - Small perf
      - Stationery focal Cortical Cataract.
- IOFB

C. by Intraocular foreign Body

- Direct Injury
  - Perforating, penetrating
- Retained IOFB
  - Opaque track in lens
- Specific Fxn
  - Siderosis Bulbi
    - Iron f.B
    - Lenticular changes — Rusting deposits arranged radially in Ant cpi & Lens Capsule
  - Chalcosis
    - Cu Alloy
    - Sunflower in PC
    - Brilliant golden green

dx in page 8

AC defects > 3mm — lenticular opacity

Traumatic lesion of Post segment

- Due to direct impact.
  - Commotio retina
  - Choroidal Rupture
  - Retinal tears
- Secondary to trauma elsewhere
  - Purtscher retinopathy
  - Valsalva "
  - Terson syndrome
  - Fat Embolism Syndrome
  - Shaken Baby Syndrome
- Traumatic RD
  - Retinal dialysis
  - GRT
  - Horseshoe tear
  - Necrotic retinal Bs
  - VB avulsion
  - Traumatic PVD
  - PP tears.

Trauma due to Direct impact

(a) Commotio Retina

Counter coup Contusive injury to retina after blunt trauma to Ant Seg of eye. ± Choroidal Rupture

- Peripheral
- Central
- Macula.
  - ↓
  - Berlin's Edema. — Self limiting. — x tere edema

Retina may appear normal at pt complain of ↓ VA.
Affected area — white & opaque after hrs
Swelling & disorganization of Outer retinal layers causes Opaqueness.
Disruption of Photoreceptor Outer Segment & RPE which is outer retinal barrier

Prognosis — good. except ≤ Subfoveolar Choroidal rupture & subfoveal hmg.

RPE damage ≤ hyperplasia of RPE
Late → minor atrophic changes to massive hyperplasia & migration ⇒ Bone Corpuscular & granular pigmentation in RP.

CME — Hole

Confluent geographic areas of whitened retina M.C appear in mid periphery.

Choroidal Rupture

5-10%

2° to

Direct impact

» Ant located At site of impact // to Ora

Indirect impact.

Post 4 * >

Single rupture » . Crescent shape

25% has multiple ruptures Concentric to OD ✓

Most rupture — temporal to disc. 66% involve Macula.

Blunt trauma — globe undergoes Mech Compression → Sudden hyperextension

↓

Sclera has tensile strength to resist it

← Retina. protected bcos of elasticity

← Bruch's Memb × tensile × elasticity

↓

∴ Breaks.

Acute phase — Small Chorio Capillaries damaged

↓

Sub RPE Hmrg

↓

+ Edema — obscure Rupture

Deep Choroidal vessels — Spared

Fibroblast activity 4-14 days

↓

During Healing — CNV is universal phenomenon

involutes

Hmrg / SRD.

Old pt — R/f for CNV → Macular Rupture

Length of ..

Distance .. to Centre

Ocular Exam → Rule out Orbital/globe #/ruptures

CNV

- Extrafoveal → Laser photocoagulat"
- Subfoveal → Anti VEGF.

Vision loss – CNV, Serous Retinal elevation, ERM formation

ERM – glial proliferation through small, tearing induced breaks in ILM

Retinal tears

Predisposed pt — ↑ Myopia, lattice deg

↓

Blow to head

↓

Acute PVD — Retinal tears.

Various types of tear

- Necrotic tears
  - ↓
  - Inj post to Ora
  - ↓
  - Direct coup effect on Retina
  - ↓
  - ↑ Retinal Necrosis & Subsequent RD
- Vitreous traction tears
  - GRT → ≥ 90° peripheral break & Vitreous gel att to Ant flap allowing independent mobility of post edge of tear
  - ↓
  - Idiopathic → ↓ 70%
  - Traumatic → ↓ 20%
  - Post edge of CRD → ↓ 10%
- Avulsion of Vitreous base
  - ↓
  - Pathognomic of Blunt trauma
  - ↓
  - Ribbon floating in Vitreous Cavity
  - tear 4m Retina & PP epithelium
  - ↓
  - RD

Dialyses → disinsection of Retina 4m Ora. which could be of Variable extent

↓

Dialysis

(*) most common IT → faster growth at Traumatic dialysis — SN → Counter coup.

Tears along A & P margins of vitreous base

» Infectotemp (direct)
↓
ON (CC)
(Trauma)

All dialysis — Traumatic

else may be familial & bilateral

Stretch tears

Traumatic Macular Hole

Also ⊆ accidental laser injuries
- lightening
- shock

Local PVD
↓
Dehiscence in fovea
↓
Avulsion of small operculum.

Dialysis

Disinsertion of retina 4mm. ora.

Vitreous att to post margin of Dialysis

Absent

× possible

GRT

Peripheral break > 90°

Ant margin. ~~& post~~.
× to pod flap.

~~×~~.

PVD

Inversion. free to move & inverts towards disc due to gravity.

Retinal & Vitreous trauma

B.V — bleed into vitreous

Acute PVD — VH

Avulsion of superficial retinal vessels

↓

Rupture of CB

RD

Formed Vitreous Traumatic RD

Trauma — liquefaction of vitreous

↓ long time

RD formation

- Demarcation line
- Atrophy of underlying RPE
- Subretinal ppt.
- Retinal Macrocysts
- Extensive Tobacco dust

× PVR. Break usually in vitreous base & break ≤ laser/cryo

ON injuries

ON sheath trauma

↑ Canal

Bony chip impinging on ON

ON avulsion

↓

Direct shock waves

↓

Intrasheath trauma/edema

↓

Indirect compression of ON

↑ dose i.v steroids

~~Scleral rupture~~

Retinitis Sclopetaria

Shock waves generated by passage of ↑ velocity missile that Orbit ≤ out. directly striking the eye.

↓

Rupture of Choroid/retina

↓

Irregular Jagged holes

↓

Mech disruption & fragmentation of retina

↓

fibrous tissue proliferation in eye

Claw like break — Bruch's & Chorio Capillaries

× RD as inflammation around edges of retina.

Scleral rupture

Common locations

- Limbus
- b/t insertion & Equator // to mal insertion

Radial & Post rupture — Uncommon

Hall Marks — Severe reduction in VA.
Afferent pupillary defect
Hypotony
Abnormal deep AC.
↓ Ocular ductions
Severe SubConj Edema, Hyphaema.
Viteous Hmrg.

CT → SubConj edema, IOFB.

Prognosis — Poor
As lead to fibroVascular proliferation

Purtscher Retinopathy

c Trauma — Chest, Head
Hmrgic, Vaso Occlusive Vasculopathy

Patho

Leukoembolisation ← Leucocyte aggregation ← ↑ by Complement 5a

↓

Arteriolar Occlusion
Infarction of avascular Bed

Etio

Traumatic Chest Compression
↑ ICT
Acute Pancreatitis
Long Bone #
Post partum period
Pre-Eclampsia shock
DIC
fat embolism
Vasculitic diseases

Cf

Unil/Bil vision loss ≤ in 2 days
- Cotton Wool Spots
- Area of retinal whitening around ON
- Intraretinal Hmrg
- Serous detatchment of Macula
- Preretinal Hmrg
- Dilated Vessel
- OD Edema.

→ if Confluence around Macula — Looks like cherry Red Spot of CRAO.

D.D

CRAO
GCA
HTN
Ocular Manifestation of HIV, Syphilis
Sjogren Syndrome
Toxoplasmosis

get proper imaging

Rx

No proven
Control of underlying disease

Valsalva Retinopathy

↑ intrathoracic pressure
↓
forceful exhalation against closed glottis
straining at stool, coughing

→ Circumscribed red blood ↓ILM
└ Boat shaped Red ↷ yellow
→ Tortuosity 2,3° vessel — AD. Hait

PPV ✓
✗ Laser hyaloidotomy as ERM fam

Terson Syndrome.

VH + Subarachnoid bleed
Numerous intraretinal subretinal bleed
↓
Post hyaloid ½ detached & scaffold for ↑ ERM over Macula

Mech — ↑IOP ⟶
Perivaginal space to OD
↓
Venous stasis via compression of O. veins

USG — To rule out RD.

Fat embolism.

medullated bones esp femur

- Petechial rash
- Resp insufficiency
- CNS Symptoms
- Purtscher's like retinopathy

good Visual prognosis
Permanent Scotoma.

Shaken Baby Syndrome.

Violent shaking of infant
Child abuse
<3yrs

Angular deceleration axs c forceful striking of head against hard surf.

Signs — Nystagmus
3N palsy.
Cortical blindness
Lid ecchymosis, edema, #

Hyphaema
Angle recession
Cataract
Tr. Retinoschisis

VH
OA.
IR thing

Mx of Traumatic Cataract

Anticipated risks & Complications

PreOp

- Calculation of IOL power → Astig
- Surgical procedure → Req. Vitrectomy

PeeOp

- Difficult Ant. Capsulorr.
- PCR
  - Nuclear fragment loss
  - Vitreous loss
  - Positioning of IOL

Post Op

- Exuberant Inflammat^n
- ↑ Post op ↑ in IOP
- Prolonged C. Edema.
- CME.
- Post op R.E.

Mx

PreOp

- Meticulous Pre-Op Evaluation
- Decision & planning for Sx Mx
- Time of Sx
- Surgical approaches
- IOL Consider

Anaesthesia

PeeOp

Post Op

Time of Sx:

- **Immediate**
  - Phacoanaphylactic Uveitis
  - Loss of lens in Vitreous
  - Lens particle, glaucoma.
- **Early** –
- **Delayed.**
  - Inflamm ↓
  - Proper healing
  - Proper decision
  - Accurate IOL measu

Meticulous Pre-Op Evaluation

RAPD.

Cornea Evaluation.

Pupillary dilatation.

Exam of lens
- Capsule rupture
- fibrotic A. Capsule plaque
- Phacodonesis
- Zonular defects
- Subluxation of lens
- Vitreous prolapse in AC

Indirect Ophthalmoscope

B scan.

Biometry & keratometry

Surgical approaches

- Anterior
  - Large lens dislocation
- Posterior
  - ± Vitrectomy & lensectomy — PCR
  - Nucleus drop

IOL Consideration

IOL from fellow Eye

size of IOL (>6mm Optic size)

IOL ± PMMA haptics

Heparin surface modified

Anaesthesia Consideration

GA

LA

- Peribulbar Block.
- Avoid stressing of zonules by overpressing.

PerOp

Incision Consideration.

- Narrow.
- Subluxated pupil

VISCO.

- Zonular D → Hyperinflat^{n} of AC
- Small pupil – Soft shell tech

Pupil & iris

- To enlarge pupil
- Repair of iridodialysis

During Capsulorrhexis

- Narrow
- L.D.
- Stain always
- Dense fibrotic subcapsular plaque

Hydro.

dissection — delineation

\+ − + −

Causes.

Phaco.

- Subluxation
- Narrow pupil
- Traumatic C.
- SFIOL.

Wound Closure

- Phaco + Trab
- Postpone Cataract Sx
- ICCE
- PP approach.
- Consider deferring Sx

Post Op Consideration

Post op inflammat" & CME.

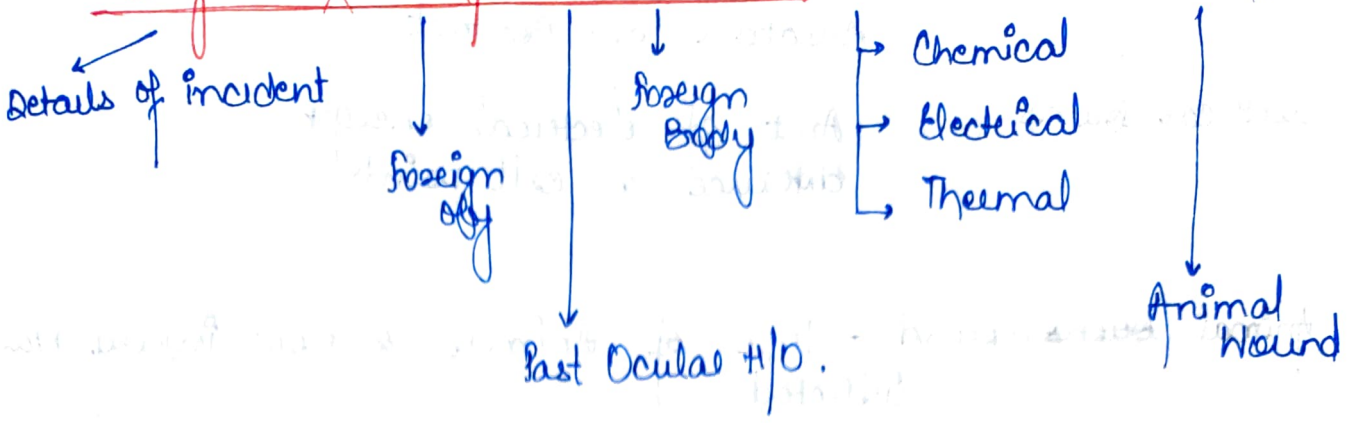
Post op glaucoma.

Malposition of IOL.

Post dislocat" of IOL

RD.

History & Exam of Trauma Case



Details

1. Date, time & location of incident
2. Mechanism of injury
3. Accidental, Intentional or self inflicted injury
4. Accident setting
5. Use of contact lens, Corrective glasses or safety glasses at time of accident.

Foreign Object

- Physical characteristics of obj causing trauma
- Distance & direction travelled to eye
- Location of the impact
- Conduction of eyewear used.

Foreign Body

- Composition of foreign body
- Origin of foreign body
- Activity at time of injury
- Possibility of single or multiple f.b.
- Distance direction & speed travelled by f.b
- Position of pt's head & direction of gaze at impact
- Description of tools at time of injury.
- Possible Contamination of f.b.

Chemical injury

- Chemical & physical properties of substance shd be established
- PH of substance shd be measured.

Thermal burns – Type & temp of involved material
Duration of contact

Electrical burns – Amt of electrical energy
Entrance & exit points.

Animal ~~burns~~ Wound - Type of Animal & how injury was inflicted
- Attack is spontaneous or provoked.
- Animal checked for transmissible disease

Past Ocular History → Pre-existing Ocular Conditions
Prior Ocular Sx
Level of vision prior to trauma
+nce of IO or periOcular appliances
Frequency of Medication used.

Exam

general

- Periorbital swelling, Hmg
  - Desmarre retractor has to be used.

Test

To be done.

Not to be done
- Scleral depression
- Color Vision testing
- FDT
- IOP check.

VA

Pupils

- Direct & Consensual reflex.

Poorly dilated
- Responsive pupil

Direct trauma to eye
- Traumatic Mydriasis
- Iris Sphincter damage
- Pharmacologically dilated

RAPD
- Damage to ON
- Diffuse Retinal injury

Fixed dilated pupil
- 3rd N Compression

Direct Injury → Nucleus. Nerve Ciliary ganglion

↑IOP

Eccentric/Peaked pupil
- Traumatic Iridodialysis
- Iris Sphincter tear
- Vitreous prolapse in AC
- Open globe injury ⊆ Iris prolapse.

) RAPD.
) RAPD by Reverse

- Brightness testing
- Colour vision. — Colour Vision testing
  fed desaturation testing
- Visual fields — CFT
  fed obj if VA poor
  ON dysfxn +
  Formal Visual field testing
  Amsler grid testing
- EOM — EOM entrapment
  Orbital #

- IOP

× check.
if req - digital IOP

↑IOP

- Lens associated
  - ACG
  - Phacomorphic
  - Lens particle g.
  - PhacoAntigenic Uveitis
- Hmg associated
  - Hyphaema
  - Hemolytic glaucoma.
  - Ghost Cell
- L associated.
  - TM disruption
  - L recession.
  - PAS from flat AC.
- AC Inflammation
- Closure of Cyclodialysis cleft
- Epithelial downgrowth

↓IOP

- Excessive filtration
  - Wound leak
  - CilioChoroidal detachm
  - Cyclodialysis cleft
  - Retinal detachment
- ↓ Aq. Production
  - IO Inflammation
  - CB Ischaemia
  - Ant PVR.

Ext Exam

Ecchymoses Ptosis f.B
Edema Laceration

Exo/Enophthalmos
Ptosis — LPS actou
PPH

Laceration — f.B, Wound exploration
Canalicular injury.

Crepitus
Bony step off deformity
Infra-Orbital hypo-esthesia.

Crepitus ← Blow Out # → Enophthalmos
→ Orbital deformity

Conjunctiva

Chemosis
SubConj Hmrg
Emphysema.
f.B
Abrasion → stain
Laceration → f.B, scleral extension

Hmrgic chemosis
SubConj Pigmentation

end

* Conj Emphysema → indicate presence of sinus #
Inspect superior tarsal conj — eversion of lid
↳ double eversion.

Cornea — Abrasions. — linear → substarsal f.b.
f.B.
Steoma — +, location, L, W, B of f.b
Seidel test if laceration.
Ulcer
DM folds.
Chemical Injury — Isch. Necrosis, blanching of vessels

Chamber

Shallow.

Full thickness CS Wound
Ant dislocated lens
Suprachoroidal Hmg
Serous Choroidal detachment
Intumescence of Lens

Deep

Post Scleral rupture
Post dislocated lens
Cyclodialysis
Iridodialysis

↓

Rule out open globe injury

↓

Gonioscopy → f.b in ∠ » Inf.

Iridodialysis
Cyclodialysis
Angle recession

- Cells & flare — Traumatic Intis
- +nce of Hyphaema / Hypopyon
- +nce of fibrin, vitreous, f.b.

Iris

f.b → Contour
pattern of iris — Contour

- Iridodialysis
  Sphincter tears
  Holes / perforation
  Traumatic Mydriasis
  Iridodonesis

Lens

Position.
Stability
Clarity
Capsular Integrity
Phacodonesis
+nce of vitreous around lens — Zonular rupture

- Traumatic Cataract — Rosette shaped
  Ant Subcapsular c
  Zechoral Cataracts

- Vossius Ring — Brown pigment Ring on Ant lens.
  Capsule resulting 4m forced IOC

- Ant capsule Violation — f.b Pu Situ
- Leakage of Cortical matter
- Intralenticular f.b.

Viteous → Pigment (tobacco dust)
Hmrg.
Debris
f.B.
Weiss Ring — PVD
Viteous Steaming — Occult Open globe Injury
WBC, Pueulence in Viteous.
Distorted pupil — Viteous prolapse

Retina/Choroid → Commotio Retina
Tears
Holes.
Dialysis
Detatchment
Hmrg — Traumatic PVD/tear

RNFL → flame shaped

Deeper layer → Irregular Blotchy

Subretinal Hmrg → +nce of f.b.
→ Dark & homogenous
→ Trunk of Choroidal rupture
→ Multiple, Concentric to OD. accompanied by subretinal Hmrg.

ONH

Edema
Hmrg
Benign glaucoma
ON → ½ or completely avulsed.

Paed

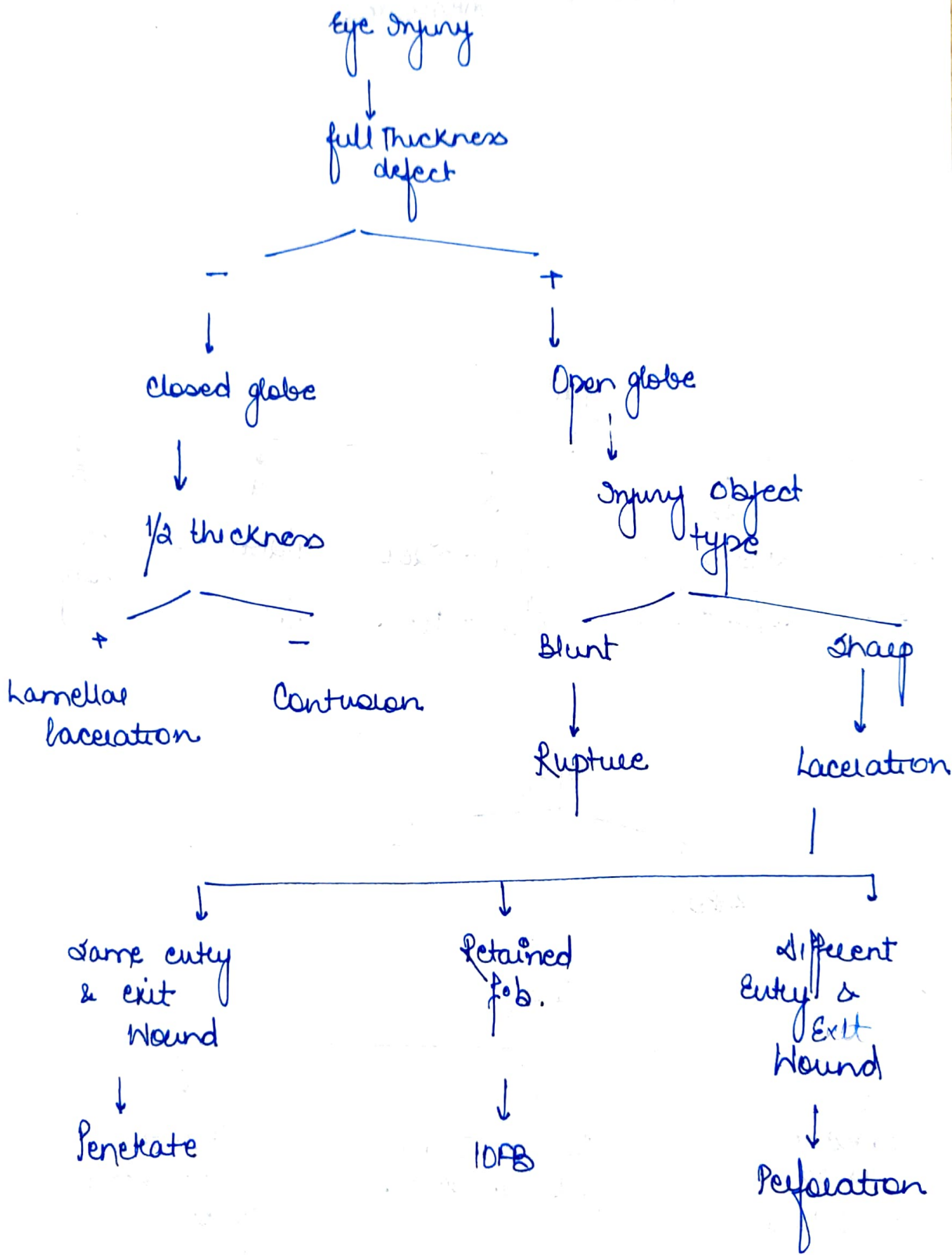
Vision Assessment
Child Abuse
└ Shaken Baby Syndrome
↓
Intracranial Hmrg.

Elderly → Repeated fall

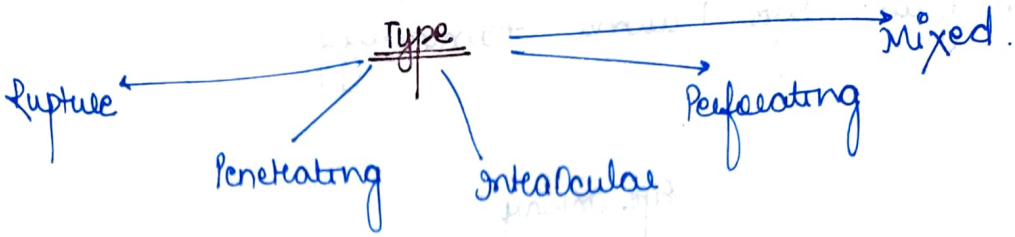
Ix	features	Adv	Dis adv
Xray	• of x MRI or CT — IOFB, Orbital #. • Screen + of metallic f.b prior to MRI	• Readily available • Bony str	Radiolucent Body x x soft tissue
CT	Axial: 1-2mm section; Best view of globe. MR, LR. Med & Lat wall Coronal: 2-4mm. SR, IR. Orbit & Roof	• Easily available • x direct contact ⊆ eyelid or globe • Both soft tissue & Bony str • Both Radio-opaque & Radiolucent f.b. • Fresh blood • ✓ Metallic f.b, pacemaker • ↓ expensive • ↓ Motion artifact • ↓ Claustrophobia	x Readily available x in Preg ♀ x ↑ resolution as USG. Spiral CT req as poor Coronal Image
Ix —	Suspected Open globe. Post seg visualize if x USG IOFB presence + of Orbital # Intracanal mass		
MRI	Vascular lesion CST. Inflammatory Demylinating ON. Peri Ocular Soft tissue Suspected Vascular lesion Locate Non Magnetic IO f.B.	- Axial, Coronal, Sagittal view - Better Soft tissue imaging - Visualizes Non Magnetic f.b. - Can be used in Preg ♀	x widely available Claustrophobia C/I — Magnetic f.b implants x Bony str as CT.
USG	0.1 - 0.01 mm resolution Vit. Retina Choroid Sclera	Dis: Exp req. - Direct Contact ⊆ lids - x for Orbital # - Post seg - IOFB	- ↑ resolution of IO structure - Provide Real time view - Portable Equi

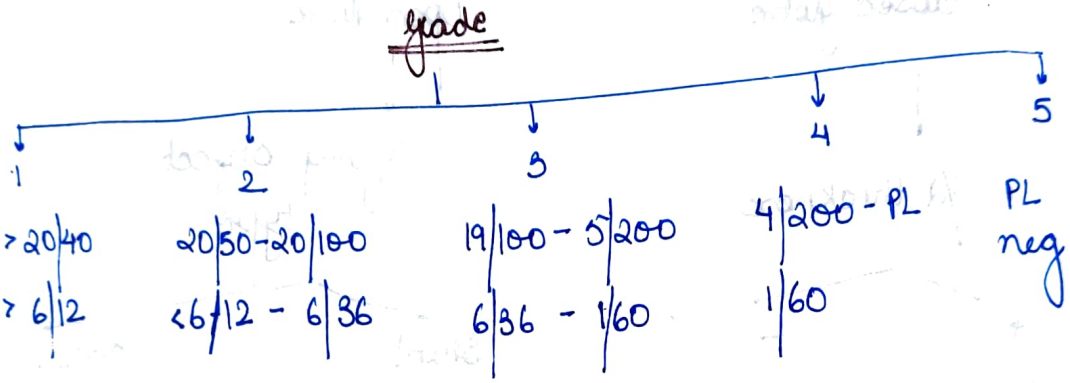
Classification of Trauma

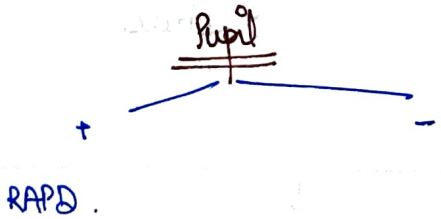
Birmingham Eye Trauma terminology

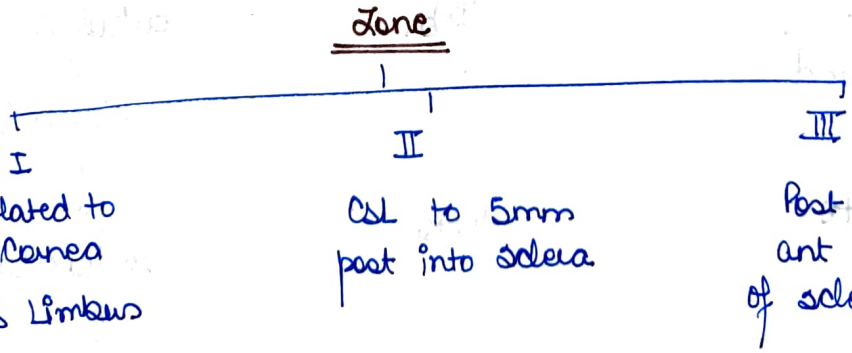


Open globe


Type
Rupture
Penetrating
Intraocular
Perforating
Mixed.


Grade
1
2
3
4
5
> 20/40
> 6/12
20/50 - 20/100
< 6/12 - 6/36
19/100 - 5/200
6/36 - 1/60
4/200 - PL
1/60
PL neg


Pupil
+
-
RAPD.


Zone
I
Isolated to Cornea
Cs Limbus
II
CSL to 5mm post into Sclera
III
Post to ant 5mm of sclera

Close globe

Type

- Contusion
- Lamellar laceration
- Superficial f.b
- Mixed

Zone

- I — External (limited to Bulbar Conj, Sclera, Cornea)
- II — Ant seg include lens & plicata
- III — Post seg → Post to Post lens Capsule

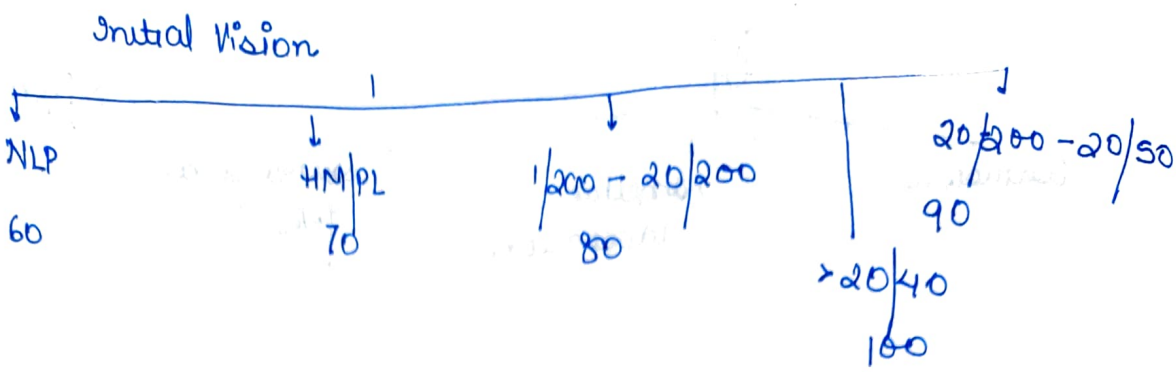
Grade

Same

Pupil

Same

OTS Score



Ruptured	23
Endophthalmitis	17
Perforating injury	14
Retinal detachment	11
Afferent Pupillary defect	10

Sum of raw pt	OTS
0-44	1
45-65	2
66-80	3
81-91	4
92-100	5

Close globe Injury

Conj, Cornea, Sclera

Conj	Cornea	Sclera
Hmg	Epithelial defect	Lamellar laceration
f.b	f.B.	F.B.
Edema	Lamellar laceration	structural integrity
Subconj air	LSC ischaemia	
Laceration		

- Chemical Injuries
-

Anterior Chamber

- ? Circle of Trauma
- Traumatic Mydriasis / Spasm of Accomodation
- T. Iritis
- Iris sphincter tears & iridodialysis
- Hyphaema
- Angle Recession
- Cyclodialysis

Lens

- Lens Subluxation & Dislocation
- Phacoanaphylactic Uveitis
- Traumatic Cataract.

Retina

Commotio Retinae.
Traumatic VH
T. Macular Hole
Choroidal Rupture

Suprachoroidal Hmg
Sclopetaria
TRD

Eyelid laceration – Canalicular injury

Orbital Trauma – Blow out #
I. Orbital f°b.
TON
Orbital Hmrg & Compartment Syndrome.

Open globe Injury

1) Rupture & Lacerations
2) Intraocular foreign Body.
3)

Closed globe Injury (Conj., Cornea, Sclera)

- Cornea erosion

  f.b. ⟶ If post- Corneal stroma involved do Seidel test

  If metallic f.b — Remove rust with Corneal burr.

- Conj laceration

  - <10mm ↓ Heal Quickly
  - >10 mm ↓ Suture.

- Lamellar Corneal & Scleral Lacerations.
- Chemical Injury

Anterior Chamber

7 Circle of Trauma
Traumatic Mydriasis / Spasm of Acc.
T. Iritis
Iris Sphincter tears & iridodialysis
Hyphaema
Angle Recession
Cyclodialysis

7 Ring of Traumatic tears

a) Iris sphincter — Radial tears
b) Iris Base — Iridodialysis
c) Anterior Ciliary Body — Angle Recession
d) CB – SS → Cyclodialysis cleft
e) TM tears
f) Zonules – Lens Subluxation & dislocation
g) Retina to Ora Serrata — RD & Dialysis
Diag also

	Traumatic Mydriasis & Spasm of Accomodation	Traumatic Iritis	Iris sphincter tear & Iridodialysis
Introduction	Symptoms – Eye pain, tearing photophobia, discomfort while reading, Ocular fatigue. Pupil – Mid dilated Poorly Rxn to light × RAPD.	Symptoms – Pain, photophobia, ↓ Vision ↓IOP AC – Cells & flare	Change of shape of pupil Monocular diplopia glare, ↓ Vision, ↓ light sensitivity
Pathophysio	Injury to Iris Mal Nerves Ciliary Body Transient Mydriasis — Long lasting ½ mydriasis ≤ poor pupillary rxn Permanence of Impaired accomodation → Inflammatory scarring of ciliary muscle & Infiltrate	Contusion → Vasospasm of Ant uveal vessels → Hyperpermeability Leakage of protein & fibrin CB Inflam → ↓ Aq. Prod → ↓IOP	Shearing of iris from CB at its root 90° to Iris plane – Trauma ∴ Rx for importance of side protection on safety glasses

Dx &

Slit lamp Exam

- TM only → Large round pupil
- TM + Sphincter tear → D shaped

Ciliary Spasm — Pain. In acute phase

Conical section → High Magnif & short, narrow slit beam placed tangentially at Max intensity

↓

Prominent Perilimbal Injection
Ciliary flush.

Rx

Symptom & Pupil Size.

a) Pilocarpine 0.25% bt side effects.
b) Thymoxamine — α Antag
c) Tinted CL
d) Hand painted / dyed lenses
e) Surgical Repair of Iris

Cycloplegia
Steroid drop Pred 1%.

Iris Sphincter tears

Shallow Indentation
Tears ext length of Iris
D pupil
Small Hyeg, Hyphaema

Iridodialysis

- Small → Crescent shaped
- Large → Disruption of Normal architect

Gonioscopy — gap bt Sclera & CB, Widening of Supra Choroidal space ± CD.

Iris Seperated 4m root — ID

Ix) Refractory Monocular dipl. ↓ Calculating glare.
Expulsive Iridodialysis
Repair ± other Sx
Cosmesis
Subtotal ID

Rx — Straight needle 10-0 prolene
- Mc Cannel Suture — Double arm
- Closed chamber Surgical tech.

Hyphaema

Blood in AC

- 2/3 — Closed globe
- 1/3 — Open globe

Presentation

Pain, photophobia, ↓ vision

Hyphaema → RBC suspended in AC but no layering
- ∴ Traumatic Iritis

Ass → Iris sphincter tears, iridodialyses, cyclodialysis, lenticular abnormality

Pathophysiology

damage to CB, iris stroma & Major arterial circle & its branches by equatorial globe expansion

IOP ✗ bleeding

- ↑ Obstr of TM by clot
  - Circulating RBC
  - Collar button shaped clot
  - LRPB
- ↓ CB inflammat°
  - ↓ Aq. production

Diagnosis

8 ball hyphaema — entire AC

document 1st visit — VA ↷ IOP ↷ Amt of bld in AC

If in Africa. or family h/o → do Lab Ix.

(X) → NSAID, Aspirin, Anti platelet

℞

Goal

- Improve pt comfort
- ↓ Prevent Rebleeding
- Monitor for complications.

Rebleed — 3-5 days after.
» Initial Bleed.
% → 0-38%.
Corneal Bld stain
↑IOP & Endothelial toxicity → Bld in stroma

Monitor
- Rebleed
- IOP.

Earlier strict Bed rest Hospitalization ⇢ OPD now.

IPD if — Severe Recalcitrant IOP ↑
follow up ✕ assured.
Hyphaema — in setting of suckling
Very young children

Cycloplegia — To prevent post synechiae
↓ photophobia, Acc spasm & pain

Corticosteroids — Inhibit fibrinolysis → ↓ Rebleed.

ACA → Aminocaproic Acid — Antifibrinolytic agent
↳ Prevent Rebleed.
But issue — Cost & side effects
— Systemic ℞, gel form

IOP ↑ ↓ | ↑

·) Topical Bednisolone acetate 1% QID – Anly
Else Systemic
·) Cycloplegia
·) full time eyeshield
·) Bathroom privileges
·) Pt upright ; 45° ∠
·) Having signs of
- rebleed
- ↑IOP
·) Daily follow up

·) Ascertain Hb pathies
·) x Borrox → Sickling due to ↓ O_2 tension
↓
Block TM → ↑ IOP.
also ↑ IOP → ON damage ≫ chances

(x) Pilocarpine
L ↑ Inflammat°
↑ risk of Post Synechiae
limit exam. of retina

Very ↑ IOP → use hyperOsmotic Agents

↑↑ IOP → ION
↑IOP in Sickle Cell An → ION

Criteria for Sx intervention →
- Microscopic Corneal Bld staining
- Total Hyphaema ≤ IOP of 50mm of Hg ∝ > (ON save)
- Total Hyphaema ≤ ↓ < 50 % in 6 days
IOP > 25 ∝ > (× Corneal stain)
- Hyphaema unresolved for 9 days
(× PAS formation)

↓

If Sickling

Repeated IOP > 30 mm

IOP > 24 in first 24 hrs foll inj.

Dx

AC Wash ± or ± cut Trabeculectomy

aim

↓ AC manipulation

Least flow to remove blood.

Beware

× damage to other structures

clear AC → No rebleed

Angle Recession

After severe Contusive trauma ⟶ ∠ recession ⟶ glaucoma

Pathophysiology

Contusive Injury

↓

↓ AP length

↓

Rapid Equatorial expansion

↓

Aq forces into periphery of AC ∠

↓

Split in CB

Longitudinal Mal of CB.	Circular Mal of CB. & iris root are forcefully separated.
↓	
Remain att to ~~CB~~ SS. ~~Iris root forcefully separated~~	

↓

Deepening & Widening of AC ∠

Small branches of Ant Ciliary artery ⟶ Injured ⟶ Co-existence of hyphema & ∠ recession

Scarring of TM ⟶ Loss of IT spaces ⟶ Scarring of SC

↓

↓ Aq flow.

↓

Subsequent elevation in IOP.

glaucoma α. Angle involved . rarely if <180°

Dx

gonioscopy → avoided in acute phase

Subtle changes – disruption of iris processes from their insertion into ss, CB leaving CB > exposed

widened CBB , > prominent SS

If entire ∠ involved compare width & color of band to fellow eye.

document → ∠ deg involved
IOP
ON.

Rx

x Use of Miotics
Laser Trabeculoplasty

Complication 6-8% develop glaucoma

Cyclodialysis

A cyclodialysis cleft forms when a portion of CB is disinserted from scleral spur, allowing free passage of Aq into suprachoroidal space.

C/F Eye pain, tenderness, ↓ vision.
Severe hypotony, Corneal failure, Phthisis bulbi

Pathophysiology free passage of Aq, AC → Suprachoroidal space = Hypotony

Cilio Choroidal detatchments + → CB dysfxn

↓

Hypotony → CS Cleft.

Dx IOP, slit lamp, gonio, fundus exam

Blurred vision ⊆ hyperopic shift ← anterior displacement of lens-iris diaphragm

↓

shortening of eye.

Hypotony. AC – C. Edema, shallow AC, Mydriasis & Peaked pupil

persists → OD edema, RV tortuosity & retinal, choroidal folds

In obscured cases → UBM.

Rx

Observation as Medical Rx & cycloplegics

↓

Atropine — proximity of CB & SS ∴ encourage closure

× CS → as delay closure

Classic → Pupil dilatn + diathermy to cleft

↓

Drainage of suprachoroidal effusion through incisions in sclera

↓

flattening Communication & Suprachoroidal effusion

•) Argon laser if × Mx Rx in 4-6 wk

└ duratn — 0.1 s

50-100μ spot size.

500-1500 mW power

& 100 application

↓

If fail

Diathery

Indirect C

↓

MC Cannel suture

& Iridodialysis

⇓

effective for smaller clefts

Direct cyclopexy

CB sutured to sclera

If very large

↓

Ant Scleral Buckle

Acid Pilocarpine

Traumatic Optic Neuropathies

- Vision loss due to an injury to forehead & infra-Orbital margin
- Trauma induced injury to ON occuring anywhere along nerve's intraOrbital to intraCranial length.

Classification

Direct

trauma transgresses normal tissue planes & disrupts Anat & fxn integrity

→ Penetrating or blunt trauma
ON avulsion, transection, ONS hmrg
O. emphysema,
VLoss ≠ & immediate

Indirect

x transgressed force transmitted 4m distance transmission of impact to intraCanalicular portion of ON.
>> common closed head injury.

Traditionally
- Direct
- Indirect

Based on site of injury
- Orbital
- Intra Canalicular
- Intra Cranial

fundus features
- OD avulsion/ trauma
- Ant Optic Neuropathy
- Post Optic Neuropathy

fundus

1. ½ ring of hmrg around ONH
2. AON
   ≤ in Ant 10 mm
   CRAO, BRAO
   CRVO, AION
3. x evidence of trauma
   OD pallor 3-5 wk later.

Clinical presentation

a) Multi System Trauma < Respi / CVS

LOC – 40%.

Head Trauma 1.6%.

Maxillofacial Tr → 25%.

H/O from friends if pt LOC

VA or Hand Method

Colour vision

Red test obj — diff in brightness of red colour

VF — Any type of defect

RAPD

Even if 6/6 vision → so RAPD ≠ VA

\+ → Unil

− → TON +, Bil

Ocular Adnexa Exam — Hmtg
Ecchymosis
Palpitation of Orbital Rim
Retropulsion

Detailed fundus Exam – ↑ ICT.

VEP.

VA loss

- ½ Complete.
- Temporary / Permanent
- Immediate / Delayed.

↓ vision & Abn pupillary fxn ⊆ ocul Ocular injury → TON

Ix

•) VEP → Unconscious pt
Bil cases — ⊆ x RAPD

↑ latency
↓ Amplitude] ON injury ≠ VA.

» in cases of Complete vision loss

•) Imaging - Intracranial lesion & Bony Inj to Cranium
1·5mm Coronal & Axial Cuts req.

CT → # Optic Canal 36-67% cases

MRI → Dx thing into ON & sheath.
→ High resolution paracoral Oblique view
→ intrasheath
→ 4mm EDH.

Pathophysiology

- ON avulsion & transaction
- ONS hematoma
- ON impingement 4m Penetrating f/b
- Bony #

Indirect Tx ← Blunt Trauma
↓
SO Margin
LO
Frontal area
Cranium



Orbital Bone ↓ Apex ← Compressive forces

↓

Contusion of intracanalicular ON axon/ pial vasculature

↓

Localized ON ischaemia & Edema

↓

further Neural Compression ⊆ in fixed diameter bony Optic Canal

↓

ppt +ve feedback loop

↓

Trigger development of an Intracanalicular Compartment syndrome

Ischaemia → Cellular & Subcellular events → Neural damage in TON.

↓

Role of O_2 free radicals
Enz
Cytokines
Intracellular Ca^{2+}

Pathogenesis

1° Blunt T → Shearing force → Indirect injury → Hmrg in Nerve & sheath ↑ Damage to μVasc of Nerve

→ Trauma induced focal axonal abn. ↓ Final seperation of Nerve to proximal & distal ↓ Wallerian deg.

2° ½ ischaemia of ON
Reperfusion injury ↓ free radicals

- CM of axons ← PUFA → Lipid peroxidation & release of free O_2 radicals
- Ca^{2+} → Voltage gated channel Recept → Intra cellular toxin to Cell death
- PMN & mϕ

Mx

Based On Cause

Direct

Indirect ← Head Trauma

↳ Cost Costeroids

↳ ON decompression

↳ Conservative Mx & Counselling

Neuroprotective Agents.

CS

Anderson popularized CS – 1982

- Improves Microcirculation
- Energy Metabolism
- Post Injury Histology & final outcomes of SC injury

As per NASCIS – Methyl Prednisolone 30mg/kg B.wt

↓

5.4 mg/kg/hr for next 24 hrs

Benefit if ≤ in 8hrs.

Harms of steroid to ON in animal models.

ON decompression

In TON in pt c failure to improve with time or steroid Rx even 2wk. after injury.

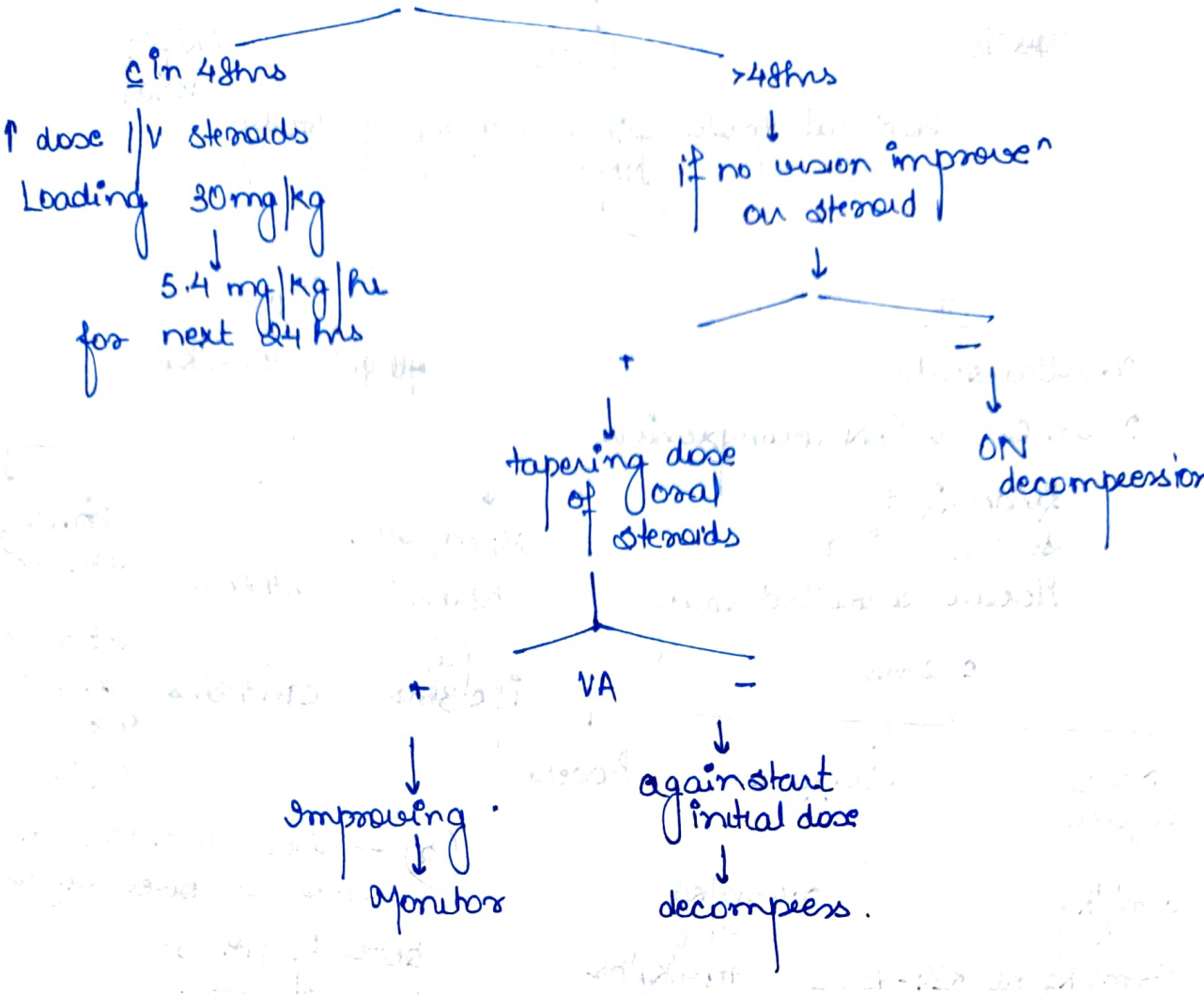
Removal of 50% of circumference
- Removal of bone along entire length
- Total longit incision of dural sheath including annulus of Zinn.

Predictors of poor Visual Outcome →

- Total loss of vision not responding to steroids
- Absence of waveform on VER.
- thce of optic canal #

TRAINING

At Our Centre



Conservative Mx ≤ gastritis, DM, ~~Sepsis~~ Immunosuppression as steroids

as steroid lead to serious complications (GI bleed, DKA)

why spinal cord trial not on ON as
- GI+H
- white matter

∴ NAION ~~II~~ regime only for stable pt ≤ severe vision loss ≤ out systemic C/I.

Clinical trials in TON

NASCIS | IONTS | CRASH trial

National Acute Spinal Cord Injury Study

NASCIS

II

Controlled study

↑ dose CS & ON decompression

Randomized
Double Blind
Placebo controlled study

≤ 12hrs

↑ dose Methylprednisolone | Naloxone | Placebo

30mg/kg
5.4mg/kg/hr ×24-48hrs (a)

5.4mg/kg
4mg/kg/hr

after 6 months
grp (a) had significant improvement in motor & sensory fxn.

8hrs | if ≤ in | > 8hrs
✓ | | ×

III

All got 30mg/kg

5.4mg/kg/hr ×24hrs if ≤ 8hrs (a)

×48hrs (b) ≤ in 3-8hrs

Tirilazad Mesylate
2.5mg/kg ×6hrs for 48hrs (c)

(b) – showed better motor recovery over Methylprednisolone
better if ≤ in 3-8hrs
bt » infections

(a) = (b) in recovery.

International ON Trauma Study (IONTS)

Largest, prospective, multi centre study of TON.

RCT

↓ 2yrs.

Observational study.

Non Randomized Interventional study Visual Outcome

133 pt c in 3 days of Injury

c out Rx

CS

Mega dose

Regime

Canal decompression.

↓

all also receive. steroids

Follow Up – 104 cases at 1mth
40 cases 6 mth.

No diff in Rx gpp.

Slines ↑VA 52%. 52%. 57%.

Results – × Benefit of CS, OND
× Rx of dose & timing

2 Biases – all received steroids ∴ does not know Natural course
– delay in initial Rx

CRASH Trial (Corticosteroid Randomization for Acute Head Trauma)

✓ Cs

× Rx

goal = 20,000
stop = 10,008
] as ↑ rate of death among pt ⊆ head trauma

↑ dose = 2g over 1hr
↓
0.4g/hr for 48hrs

Result — ↑ rate of death
× effect of steroid diff by timing of inj/severity
↓
- Cs × in Traumatic Brain Injury
- do take informed consent before starting steroid

Pathophysiology

a) Direct deformation of skull & Optic Canal
b) Shearing of ON Invasculature
c) Tearing of Nerve Axons
d) Contusion of Nerve against Optic Canal
e) Iatrogenic ON injury
   - L Ethmoidal Endoscopic Sinus Sx
   - L Retrobulbar Anaesthesia.
   - L Orbital Apex Sx
   - L Reduction of Midfacial #

A poor prognosis is associated c

- No PL immediately after trauma
- Advance age
- RAPD large
- Impingement of ON by bony frag
- Intrasheath thing not properly evacuated.

Closed globe injuries — Lens

Exam

Position of lens determined
- L/2 dehiscence — Subluxation
- Complete " — Dislocation

Contusive injury → Phacodonesis — shimmer of lens
- Pt to left & then to Centre.
- Pounding closed fist to table of slit lamp

Frank, profound movement of iris-lens diaphragm.

ass c — Iridodonesis
Asymmetric ACD
Eccentric pupil
+nce of uveal tissue at pupillary margin, c in AC.

If Corneal Injury +nt look for –:
- Iris transillumination defects.
- disruption of AC
- +nce of intralenticular f.b.

Ant laceration + Violated lens Capsule ⇒ IOFB.

Usg –ve — do CT
× MRI

~~Dx DD~~

- Lens Subluxation & dislocation
- Phacoanaphylactic uveitis
- Traumatic Cataract.

Lens Subluxation & Dislocation

- ↑ incomplete Zonular disruption.
  ↓
  Lens drawn away from site of Zonular rupture
  ACD.

- If H/O ↓x then extended lens
- ↓ Scleral rupture — M.C. ↓t limbus & spiral of Tillaux
  in SN & ST Quad.
  └ In SubCon space

Hypotony + Circumf SubCon Hmrg] ⇒ Globe Rupture

Symptoms

Astigmatism, Monocular diplopia
2° Myopic lens changes
Severe Vision loss — as Aphakic

℞

CL, Spectacles
Miotics use.

↓x → ↑ too thick for phacoEmg
↓x → VRSx
↓x → Mild → Capsular hook, CTR.
↑ too thick for phacoEmg → Bring in AC & remove through limbal Wound.

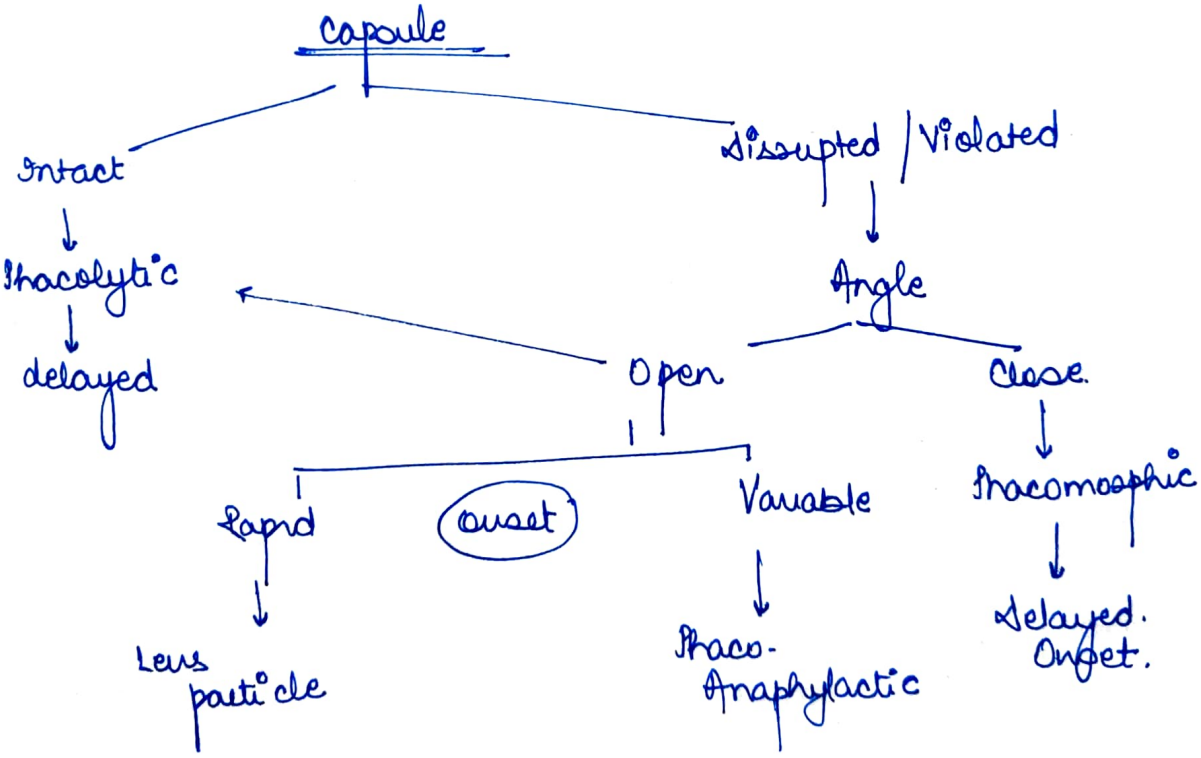
↑ Ant dislocat^{n} — RPE — Anti Inflamm + glaucoma ℞
└ Corneal lenticular touch → Endothelial dysfxn

Phacoanaphylactic Uveitis

Immune response against lens protein following traumatic lens capsule disruption.

Assc — Chemosis, Conj injection, AC cell & flare
Large KPs

IOP ↓
IO inflammation — Rx by steroids
Removal of lens — definitive Rx



Closed globe injury Post Segment

Commotio Retina
T. Macular Hole
T. Vitreous Hmrg
Choroidal Rupture
Suprachoroidal Hmrg
Sclopeteria
TRD

Traumatic Vitreous Hmrg

Cf → Sudden, punctate, web like floaters
VA measured in light was normal than measured in dark. owing to intraocular light scatter.

Etio RVD, RD, Retinal tear, pexisting PDR.
In child suspect abuse

Course — undergoes clot formation & distinct borders
↓
Sld diffuse → in child/infant
VH request & in cloquet's Canal remain for long period & reabsorb slowly.

If vitreochemized eye or liquefied vitreous
↓
Sld clears more rapidly
↓
yellow hue

USG → If media hazy → IOFB, Eyewall deformities. RD.
If VH behind hyaloid may mimic RD. ∴ positional shifting of Hmrg distinguish it from Retina.

Mx

Closed globe injury
c
VH. c x Retinal break
↓
Spontaneous clearance
Bed Rest
Head elevation
↓
2wk later see for timing Resolution of RD.

c out Pre existing vitreous detachment
↓
Risk of RD ↑
∴ repeated follow up exam (USG)
↓
If retina involved
↓
VRSx if VH > 2mth

Tear + VH obscure
↓
VRSx c in 2wk of presentation

RD + — c in 1wk

Child — Amblyopic age
Deprivation Amblyopia
VH → ↑AL → Anisometropia (> 1.5 D)

Non clearing VH
glaucoma, Hemosiderosis, PVR, 2° OAG
Long standing VH → Retina damage
Fe toxicity
Breakdown of RBC memb → Synchisis Scintillans x/c/as Cholesterolosis Bulbi

Traumatic Macular Hole

Causes —: Contusive Ocular Trauma
Electrical injury
Nd: YAG LASER
Thermal lasers

Mech — Surf traction at VR interface during Equatorial expansion & flattening of Post pole
↓
Initiates hole formation.

10% FTMH.
Acute Traumatic hole < 1/2 DD.
Chronic >

Suprachoroidal Hmrg

Hmrgic CD. Potential space b/t Choroid & Sclera. extending from ora Ant to ON post. Choroid anchored at Vortex. Vein → dome shaped appearance of CD.
due to rupture of Long or Short posterial CA.
Hmrg CD → Penetrating Inj ∴ look for Open globe Inj.

USG – Hmrg CD → Non mobile, flat/dome shaped echo dense spaces in Supra Choroidal space

Drainage done 7-14 days post injury

Poor prognosis → 360° deg of Choroidal Hmrg.
Vitreous & Retinal Wound Incarceration
RD
Apposed Retinal Surf > 14 days.

Closed globe Injury - Eyelid laceration

Eyelid laceration Repair ← → Lacrimal system / Canalicular Inj Repair

Canalicular lacerations

carefully inspect of universe → do probing

Dx Repair

- Monocanalicular → Mini Monoca
- Bicanalicular → donut stent (* difficult) Crawford stent (x in office setting)

(*) » pt who do not have common Canaliculus Inj

Bicanalicular → More stable, Less likely to dislodge

How to Identify cut ends of tube →
- white sheen of epithelial lined tube
- Paint area ⊆ sterile fluorescein strip.
- Inject dyed saline / Visco
- Inject air through punctum.
- If proximal cut end not visible → Insert pigtail probe.

Mini Monoca In Laceration involving one canaliculus.

Identify lacerated ends → Trim Monocanalicular stent to appropriate size → dilate punctum & advance thr lacerated edges → Approx deep soft tissue → close the skin → Place two interrupted sutures thru M & L. ends of footplate

Donut stent Using pig tail probe (Also in Goti's involving LS)
medial canthal reconstructions

Thread sutures using pigtail
↓
Then pass stent
↓
Approx tissue.
↓
Sutule.

Crawford stent

stent to be underneath inferior turbinate & groove director such as Tse-Anderson groove dissector (10mA) or Crawford hook
↓
Secure plates.

Closed Globe Injuries – Orbital trauma

Contusive | Penetrating

Velocity of trauma > Imp.

Evaluation → Other System. TT Inj.
For GA — NPO. Use of Anticoagulants

- Ptosis
- Crepitus
- Diplopia
- Enophthalmos
- Sensation in Infra-Orbital N

- Orbital blow out #
- Traumatic Optic Neuropathy
- Intra Orbital f.b
- Orbital Hmeg & Compartment Syndrome.

Orbital Hmeg & Compartment Syndrome

Etio

Trauma.

Iatrogenic
- Hmeg due to block.
- Post Sx Bleeding

Spontaneous Cause
- Hmeg due to trauma
- .. . Vascular lesions.

Trauma → bleed in various spaces

Susceptibility → Anatomy & Small size

Ischaemia of O. tissue & ↑ IOP

↓ likely Compartment c large #.

C/F

↓ vision, pain, diplopia. Life threatening head trauma

↓VA, ↑IOP, RAPD, Periorbital ecchymoses
Subcony Hmeg, Conj chemosis
Proptosis, Taut Orbital Content, choroidal fold, CRAO

CT/MRI — ONS haematoma — ONS fenestration

℞

Mild to moderate ↑IOP → Glaucoma medicat^{n} & observation

ON ∝ Retinal circulation compromised → Immediate definite ℞

Canthotomy & cantholysis of LC tendon → ↑ Orbital vol move eye Anteriorly

Success — ↓IOP, better VA, reversal of RAPD

Inferior cantholysis initially performed

↓

Sup. if req.

↓

further decompress

a) Lid crease incision — Open Orbital septum
b) Inferior subciliary incision — explore IT orbit
c) Surgically decompress bony orbit.

LC Canthotomy & Cantholysis

- Clamp LC ⊆ hemostat
- Cut ⊆ Steven blade
- Lat pressure applied to scissors as Canthotomy performed

Inferior Lateral Canthal tendon Stemmed ⊆ Scissors

Orbital Blow out

Anatomy of Orbit — Pyramidal structure. Roof & lat wall are the thickest. Thinnest orbital bones are floor medial to Infra Orbital groove. & ethmoidal bone of medial wall, the lamina papyracea. Separate 4m Maxillary & ethmoid sinuses resp.

Contusive Orbital injuries → # inf → Nerve traumatized → hypo. aesthesia
IR runs along Orbital floor & is prone to entrapment fall Orbital floor #.

Pathophysiology

Mode of injury.
Expansion of Orbital vol. into adj sinuses.
Thin bones → # ∴ ↓ pressure on globe ∴ ↓ globe rupture

2 Theories

Hydraulic.

↑ Orbital hydrostatic pressure
↓
Direct pressure on globe
↓
Thin Bony walls to # before globe rupture

Buckling theory.

Pressure directed against sturdy Orbital Margins
↓
Transient deformation of bones
↓
resultant # of thin Orbital walls

Pure Orbital # → where orbital rim is not #.

Evaluation

- EOM check.
- Ext inspection of ecchymoses & orbital step off
- Palpation for S.C emphysema & orbital step off
- Brief Neurologic Exam. L cleptus.
- Measurement of Pel. Proptosis or Exophthalmos
- Slit lamp exam — subCony Hmeg, Conj chemosis & further Ocular injury.

- Cleptus — » after blow the nose.
- IR — swollen & Hmegic — ↓ infraduction, Diplopia
- step off
- other Ocular inj — Corneal abrasion, Traumatic hyphaem Iritis, Ruptured globe, Cammotic, RD
- C

Ix

Cr Scan — Procedure of choice
- Axial & Coronal Cuts
  - Look for Medial wall.
  - Inspect bony apex — for posterior ledge of Non # bone.
  - Look for associated facial # combined floor #.

Rx

Early — Late

Based on Wall involved

floor — Medial — Lateral — Tripod.

Immediate

Systemic Oral Abx
Nasal Congestant
Ice Packs

Wait 7-10 days → allowing edema & Hmg to resolve
Initial diplopia due to Hmg & edema → resolves

Dx for Dx

a) Evidence of IR entrapment of perimuscular tissues with diplopia
b) Significant enophthalmos. 7-10 days after trauma
c) Injuries that are high risk for further enophthalmos
   1) Large # of floor or medial wall
   2) Combined Medial Wall or floor #.

Diplopia

- Resolves spontaneously.
- after 7-10 days persist
  - FBT → IR entrapment
  - FGT → diff dft swelling & hematoma

Suspect early as late enophthalmos — complicated by.
- Orbital fat atrophy
- shortening of EOM.

Floor

Transcay — Subciliary

Periosteum
↓
Periorbita
↓
Identify post ledge of # floor
↓
Place implant — Nylon sheets (Supramid)
Porous polyethylene
Teflon.
Bone.

Med Wall

floor — Transcaruncular Incision.

- Do put LL traction sutures for taping & prevent exposure
- Avoid steroids. EXS.

Urgent fx # →

Trapdoor #
White eyed blow out #
Inf wall break — in children & Adult
Hinged., Non Comminuted floor #

IR entrapment — Entrapment of periorbital tissue

↓

Greenstick #

Orbital tissue incarcerated → Restriction on Upgaze → Oculocardiac Reflex

Life threatening condition — causing heart block.
Coronal CT show — absent IR → Tear drop Sign
24-72hrs Sx

Medial Wall

Thin ethmoid bone, lamina papyracea
Common cause of Emphysema.

Complication → MR entrapment, Orbital emphysema, pseudo DRS
└ If large # → MR entrap

Roof

RTA, fall from Ht. involve frontal sinuses & intracranial structures.

Complication — csf leak due to dural tears
intracranial Hmrg, Ocular imbalance
Limited upgaze, Ptosis, Traumatic encephalocele
Meningitis, Brain abscess

Superior sub periosteal hematoma → downward displacement of eye

- Simple # → Brow incision
- Complicated → Neuro & ENT Consultat^{n}

Naso ethmoidal

Contusive trauma to mid sector of upper face

- # Nasal & ethmoidal bone
- Widening of InterCanthal distance
- flattening of Nasal Bridge
- # thru lacrimal drainage system.

Imtime involve Cibriform plate
&o. Neuro Sx intervention

Lateral Wall

Rarely cause motility disturbance
May require Sx if impinge on Orbital Contents

Trimalar

Tripod, Tripartite # involving Zygomatic bone
2 places → Around. fronto Zygomatic Suture
Zygomatic arch
Inferior Orbital rim near Zygomatico-maxillary Suture

Displacement of zygoma.
flattening of Malar Eminence
Rounding & depression of lat Canthal L
Entrapment of Orbit ⊆ Enophthalmos
Hypoesthesia
Cheek flattening
Chewing difficulty → Trismus

Midfacial

Lefoste # involve lower aspect of Maxilla & Orbit

Lefoste II → Pyramidal # → Maxilla, Nasal Bone, Inf Orbital Rim, LG

Lefoste III – Craniofacial dysjxn → Nasal bones, Med & lat Orbital wall, Zygomatic arches & facial skeleton connected to Cranium only c soft tissue

→ Orbital involvement → EOM entrapment & diplopia.

Other Sx

- Heabsmus Sx → BSV in 1° position.
- Blepharoplasty of Opp/ Upper eyelid to mask Enophthal of Trauma side.

Early

Infection
Bleeding
Loss of vision
Diplopia

↓

Too large O. implant

- ON Compression
- Transient Post op. diplopia
- Scaring & fibrosis of IR.
- Strabismus Dx req.

Late

Related to O. implant

Infra Orbital inclusion cysts

Late bleed in Capsule

Repair of Old # difficult
{ fibrosis
fat atrophy

IOFB

Ix for

Removal

- Easily accessible anterior location
- Organic matter or copper
- Inflammatory Rxn
- Sharp edges that threaten critical structures
- Impingement on EOM or nerves causing fxn defects.

Observation

- Small, smooth, inert post located intra-orbital f.b
- Absence of infection & inflammation
- Lack of current or Potential visual compromise
- High risk of iatrogenic injury during Ix removal

Open globe injuries

Rupture
full thickness eye wall wound caused by blunt object

Laceration
full thickness eyewall wound caused by sharp object

- Epidemiology
- Pathophysiology

stellate ragged edges → cause significant intraocular disruption

↓

at weakest point of sclera

cleaner edges → cause ↓ intraocular disruption than comparably sized ruptures.

- Evaluation
- Pre-Op Mx & Counselling
- Sx Mx → Corneal lacerations
  C-S
  Scleral
  Ruptured globe repair

- Post Op Mx
- Complications & Outcomes
- Conclusions.

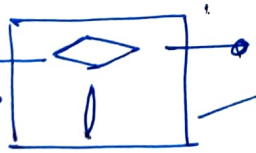
Principle of suturing corneal laceration

1° aim
Complete water tight closure of globe & restoration of structural integrity

2° aim
Avoidance of Uveal & Vitreous incarceration in wound
Removal of Necrotic debris
" " dissepted lens
foreign body

- keratorefractive principles
  - ↓
  - Microcmechanical effect
- Effect attributable to laceration
  - ↓
  - keratometric flattening due to gaping of wound
  - Valve Rule of Elsner.
- Effect attributable to sutures

Valve Rule of Elsner → Incision through wall of globe produce valve Margin of H_2O tightness = Projection of suface incision onto the suface of globe



⊥ edges / Vertical Incision
- ↓
- gape ✓
- Requisite suture

Bevelled edges
- ↓ gape
- Spontaneous closure

Effect attributable to suture

flatten the area where applied & steeper the cornea in centre & nearer to visual axis.

5 components –:
- Compression factors
- Torquing
- Splinting
- Tissue
  - Eversion
  - Inversion

1) suture – compression effect ⊆ in loop. Area of compression = length of suture ∴ longer suture used

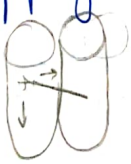
2) interrupted suture generate plane of compression in tissue contained ⊆ in suture loop
   zone of " away from suture

compressive zone — Triangular configuration
Longer suture — put away from visual axis

3) Lowsey Hays Tech → Corneal periphery ⊆ long light suture. Corneal centre ⊆ shorter widely spaced minimally compressive tissue bites — conserving new steepened central cornea.
   ↳ Estimate/ control astigmatism — using safety pin.



4) ⊥ to laceration because oblique suture produce tissue torque → wound slippage → ↑ gape & Leakage





5) Single interrupted
   ↓
   Everting = inverting forces
   ↓
   Tendency for tissue elevation & depression

Running suture
↓
suture everting tendency over. Intestinal suture bite

6) Equal depth of suturing on both sides.
Unequal " → Wound over-riding
↓
Microknedge Resection
↓
flattening of surrounding cornea
↓
Irregular Corneal Surface.

Repair of Non Perforating Corneal Injury

- Non gaping Non Over-riding → Pressure patching c A.B
- Unstable Deeper Laceration → BCL +
- of avulsed Cornea → Sutures req.

a) Simple full thickness Corneal Laceration

- <2mm
  - Self sealing Non displaced → BCL
  - Non Self sealing Stellate, Tissued loss → glue + BCL
  - Non Co-op pt. Child Mentally Retarded → Definite Sx
- >2mm → Definite Sx

b) Stellate, Angular, Intersectional laceration →
Multiple Interrupted Suture
Bridging Suture
X Suture, Purse String suture

TRAUMA

Cs laceration

c Iris Incarceration

Putting sutures & sweeping Iris

GA

F.B. Iris

- Cut → Devitalized Macerated Prolapsed tissue >24hrs
  - 90% depth → react for infection to reach AC
  - < → Wound gape.
- Repost

Tight sutures as shd not loosen once C. edema resolves

c Incarceration of lens

↓

NO immediate

bt yes if

- Lens matter in AC
- Obstruct view of Post chamber

↓

2° IOL planned

Vitreous loss Incarceration

↓

Poor prognosis Visual potential

- \+ → Bimanual + Ant vitrectomy
- − → Enucleate

Repair of scleral injury

↓

Know the extent

↓

Close as you go tch

May require to explore under Mal

Combined cornea scleral injury

↓

1st suture at limbus.

Post op Mx

- Presenting VA > 6/60
- W. location anterior to PP.
- W. length of ≤ 10 mm.
- Sharp Mech of injury

Poor → >20 extend post.

Open globe Injury · IOFB (Ocular)

H/O

- Subcon Hmeg
- Iris tear/sphincter defect
- Hyphaema
- Focal lens Opacity
- Scleral laceration
- Violation of Ant & Post lens Capsule
- Vitreous Hmeg
- Intra/Subretinal Hmeg
- Relative Hypotony
- Deep AC compared to fellow eye
- Visible foreign Body
- Inferior focal Corneal Edema

℞ 4 goals

- Preservation of vision
- Prevention of Infection
- Restoration of Normal eye architecture
- Prevention of Long term Sequelae.

- AC foreign Body
- Intralenticular f.b
- Post Segment f.b

IOFB classification

- Inert
  - Metallic (Precious)
    - Gold
    - Silver
    - Platinum
  - Non Metallic
    - Stone
    - Concrete
    - Coal
    - Carbon
    - Gunpowder
    - Glass
    - Thermoplastics
    - Rubber
    - Talc.
    - Silk.
- Irritative
  - Metals
    - Pb
    - Ni
    - Al
    - Hg
    - Cu
      - Brass
      - Bronze
      - Iron
- Organised
  - Animal
    - Bone
    - Cilia.
  - Vegetable
    - Cotton fibres
    - Wood.
    - Starch grain yeast

Delayed Complication of Ocular Injury

- Traumatic Iritis
- T. Cataract
- Delayed Trauma Rel glaucoma
  - Angle Recession
  - VH Induced by
  - Lens Induced by
- RD
- Metallosis Bulbi
- Sympathetic Bulbi
- Choroidal NV ass c Choroidal Rupture
- Traumatic Endophthalmitis

Hemolytic Hmeg Induced glaucoma

RBC breakdown products filter into AC

a) Ghost cell glaucoma — deHb cells — more rigid & spherical than regular → mechanically block TM
- shrunken obscured cells in AC → layer out as Pseudo hypopyon

b) Hemolytic glaucoma → Breakdown of RBC → cellular debris, free Hb. & mp laden c breakdown products to mechanically obstruct TM.

c) Hemosiderotic glaucoma → Breakdown of RBC → Iron freed → Toxic to endothelium lining TM → sclerosis & Malfxn of Aq egress frm eye & subsequently elevated IOP.

Metallosis Bulbi

Well Tolerated
- gold
- Platinum

Toxic
- Iron
- Copper

Siderosis Bulbi — Ocular Siderosis

Toxic effects on eye from retained iron containing IOFB

Ocular Hemosiderosis – Toxic effects on eye from iron released following a massive intraocular Hmrg.

∝ Size, Amt of Encapsulation, Location of IOFB.

Factors
- Smaller f.b are better tolerated.
- Resorbed Spont
- Fibrotic Encapsulation — limit dispersion
- Amt Fe containing IOFB better tolerated than equivalent post seg f.b.
- Rarely remains without causing Toxicity

Histo Reveals deposition of iron breakdown products throughout tissues of eye.

Siderosome → discrete intracellular organelle that contain Fe breakdown products.

Cf

18 days — yes.

a) Iris heterochromia — Involved darker
b) Poorly reactive, enlarged pupil
c) Amt subcapsular lens deposits

CF

d) Dark Corneal Endothelium deposits
e) OD edema ⊆ Angiogeaphic leakage
f) Pigmentary Retinopathy — typically a late finding

ERG →

Every 2-3 mth
- Large a Wave
- Normal b Wave — early in course
⊆ diminished (or possibly extinguished) b Wave amplitude later in the course.

Chalcosis

Retained Cu containing IOFB

Sources Explosions & Industrial work ⊆ Cu alloys

Cu Alloys — Brass] < 80% Cu.
Bronze

- Acute fulminant Endophthalmitis
- Indolent deposition of Cu in various ocular BM

Expedient removal of offending F.B
× / universally, even with pure Cu F.B.

Chronic Chalcosis — If. < 85% Cu.
↓ Inflamm response

Classic findings

- Sunflower Cataract
- Iris heterochromia (greenish discoloured)
- deposits on Retinal Surf.
- fine Cu. particles in Aq, & Vitreous
- Kayser Fleischer

Diagnostic Tests in Ocular Trauma

- Plain Radiography
- Vitreosonography/Doppler
- Computed Tomography
- Magnetic Resonance Imaging
- Magnetic Foreign Body Detectors
- Electrophysiological Tests, ERG / VER

Plain Radiography

- Indicated in detection and localization of Radio Opaque FB/suspected fractures.
- Advantages of less cost/easy availability
- Disadvantage of poor delineation of relationship of FB to globe
- Caldwell/Modified Caldwell/Water's/Lateral/Oblique(Rhese) View.

Limbal Ring Localization

- Inaccurate/Fallacious if not associated with axial length measurement
- Rough estimate if USG/CT not available
- Technician dependent/gaze dependent.

Computed Tomography

- Contrast enhancement is not necessary
- Advantages of better definition of fractures/tissue entrapment/spatial relationship of foreign body to globe/air in orbit
- Limitations of localization: artifacts due to high attenuation coefficient objects
- Confirmatory scanning must following FB removal (due to artifacts)

Ultrasonography

- Advantage of simplicity and no radiation hazard
- Ideal for imaging posterior segment structures
- Limitations of inadequate anterior segment visualization (Immersion Scan necessary)/Contact (cannot be used in severity lacerated eye).
- A & B-scan complement each other
- Enables Biometry
- Can miss FB/RD behind dense haemorrhage/scanning inadequate sectors
- Magnetic/nonmagnetic by Pelnner and Passmore's technique

MRI

- No radiation hazard
- Nonmagnetic FB better visualized/? Ideal for imaging the optic canal
- Contraindicated if suspicion of metallic FB /in patients with pacemakers/aneurysmal clips
- Motion artifacts due to prolonged imaging time (10-30 minutes)
- Poorly demonstrates orbital fractures

Magnetic Foreign Body Detectors

- Berman locator: largely supplanted by CT
- Roper hall to distinguish between magnetic and non magnetic FB
- Indicated if use of magnet is contemplated (e.g. small metallic FB intraocularly lying in or close to the ocular coats)
- No beeps/intermittent beeps/continuous beep
- Use lid sutures/no lid speculum
- Learn to use preoperatively not intraoperatively.

Electrophysiological Tests

- ERG indicated in opaque media when USG proves inconclusive regarding retinal status
- VER (Flash) is considered the single best predictor of prognosis in opaque media
- VER is also indicated when media is clear if visual loss is unexplainable
- Always compare with fellow eye

Factors Portending A Significant Ocular Injury

- Markedly reduced visual acuity
- A relative afferent pupillary defect
- Relative shallowing of the anterior chamber
- Irregularity of the pupil
- Conjunctival chemosis
- Hyphaema and vitreous haemorrhage
- Markedly reduced intraocular pressure

Ocular Trauma : Preparation

Aims:

- To minimize possibility of further trauma
- Minimize risk of infection
- Minimize psychological trauma
- Minimize legal exposure

Minimize Further Trauma

- Protective covering to injured eye gently padded and eyeshield taped no ointment/drop
- Parenteral analgesics/sedation/I/V line
- Operate within 24-36 hours (NPO 6 hours)
- Being prepared for additional procedures (lensectomy/vitrectomy)
- No lid speculum/gentle painting and draping

Minimize Legal Exposure

- Informed written consent
- Special consent for enucleation/high risk consent
- Maintaining accurate clinical records/MLC records.

Minimize Infectious Risk

- Tetanus prophylaxis
- Intravenous antibiotics Cefazolin 1g every 8 hours IV/Gentamicin 80mg every 8 hours IV
- Topical antibiotics if sealed perforation/minimal prolapse Cefazolin 33mg/ml; Gentamicin 14mg/ml
- Early removal of RIOFB
- In high risk cases, prophylactic intravitreal injection, Vancomycin 1000 µg / 0.1 ml; Amikacin 400 µg / 0.08 ml

Minimize Psychological Trauma

- Be gentle but frank in informing patient that :
- All ocular injuries are serious
- Outcomes are impossible to predict at time of trauma
- If vision retained, deficit likely
- Possibility of enucleation ; immediate/eventual ;
- Prolonged postoperative course more than one operation.

Ocular Pathology

- Rb.
- Rhabdomyosaecoma
- Meningioma
- ON glioma
- SCC
- SCC
- Malignant Melanoma
- Kaposi
- Merkel Cell
- Lacrimal gland
  - Pleiomorphic Adenoma.
  - Adenocystic Carcinoma

Retinoblastoma

- Flexner Wintersteiner
  - Neuropil
  - Central clearing
  - Retinoblasts
- Homer Wright
- Fleurettes

Rb — Small basophilic cells & large hyperchromatic nuclei & scanty cytoplasm.

Rhabdomyosaecoma

- Alveolar
  - good prognosis.
- Embryonal
  - Worst prognosis

→ Rhabdoid cell.
Eccentric Nucleus
filaments filled.

SMA +
Desmin +
Myogen +

MyoD + ve.

Lacrimal gland Tx

a) Pleiomorphic Ly Adenoma.

— glandular tissue
Sq. differentiation
— Keratin formation

b) Adenoid Cystic Ca

Nests of basaloid cells

Solid area/pattern

Cribriform area or Cookie Cutter appearance.

Meningioma

Syncitial pattern of cells
↳ whorling
↳ various pattern

Meningothelial
Psammomatous — dystrophic calcificat°

Low grade Tx — Nerve infiltrate problem because of compressive lesion

ON glioma — fibrillary astrocytes
Spindle shaped asteocytes
glial filaments.

Lid lesion / Carcinoma

1) Squamous Cell Ca

Acanthotic Sq. epithelium

Dermis ↕

→ Islands of dysplastic Sq. epithelium in dermis. (Keratin pearls)

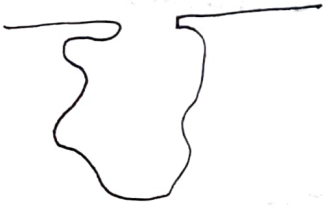
• Sebaceous Cell Ca





- Cells c large hyperchromatic nuclei
- Basaloid cell.
- Atypia
- Mitosis
- fat globules (vacuoles) (Empty)

• Basal Cell Ca





Peripheral palisade of cells

Basaloid cells
Mitosis

Retraction artifact

Downward proliferation of lobules of Basophilic cells

•) Merckel cell



Sheets of Merkel Cell (small round blue cells
Very Malignant " Neuroendocrine cells of
stain
S-100 tve, Pan CK +
cause:- Merkel Polyoma virus

•) Kaposi Sarcoma



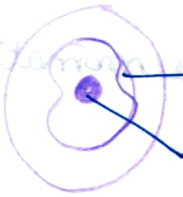
Spindle shaped cells of endothelial origin
Vascular channel



Endothelium of BV → Spindle Cell.

Malignant Melanoma.
A fav
B Worse

Spindle Cell



Pleomorphic cells, irregular nucleai Membeane
Cheesy Red Nucleoli Nucler (slender, Oval, plump nuclei)

a) fusiform cell



b) Epitheloid cell — Most Malignant Poor Prognosis
- Large pleomorphic cell
c distinct cell Memb
Large Vesicular Nuclei c Prominent Nucleoli
Abundant Cytoplasm

IHC

Sensitive → S100

Specific → HMB 45, Melan A

ABCDE
Colour, Depth of invasion
A-Asymmetry, B-Border irregularity, C-Colour variegation, D-Diameter >6mm, E-Extension into epidermis
Staging
Irregular borders

- Oncocytoma
- Warthin Tx (Cystadenoma)
- Muco Epidermoid
- Carcinosarcoma
- Malig Mixed

JOFB

Methods of detection/Investigations

- ∝ Magnetic property of F.B.
- USG
- ERG
- ∝ electrical conductivity & induction
  - Bermann's locator
  - Lopez Hall's locator
  - Caeray's locator
  - Ophthalmometalloscope of Hale
- ∝ chemical analysis
- Radiological
  - X-ray
  - CT
  - MRI

- Direct Method
- Relational movements of eye
  - Comberg's method
  - Horst Lovac CL.
- Geometric progression
- Methods based on delineation of globe using contrast media
- Bare feee methods / Vogt's Method
- Stereoscopic method
- Mackinzie Davidson
- Sweet's Method.
- Dixon's Method

Removal by Magnets

Types of Magnets

- Hand held
- Giant or Bronson's
  - Haab's type.
  - Ring method.
- IntraOcular

Corneal tear Repair

Goals

Restoration of structural Integrity of cornea
A watertight globe
Restoration of optical properties

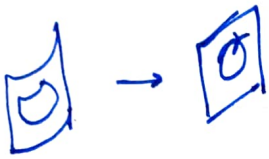
10-0
spatulate

Principle

a) Prefer Interrupted suture → Running suture

Most favourable configuration after tying

Planar Look.



Straight line

↓

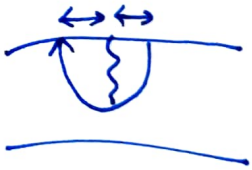
Horizontal Wound slippage.

» in Lagged Wound



Principle 2

Length = 1.5mm
90% deep
Equal depth on both sides



Shallow suture

↓

Most Wound gaping

Unequal depth of suture

↓

Wound override

full thickness suture

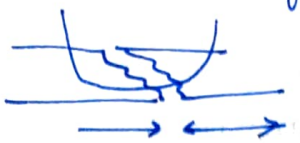
↓

Suture teach.

Principle 3

Sheloed Laceration.

Equidistance from posterior edge





of 4mm Ant Margin

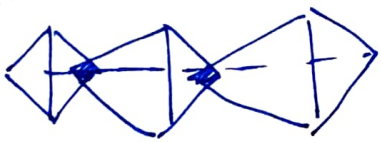
- Tissue over riding
- Tissue distortion.

Principle 4

Zone of Compression

In Interrupted suture





a=b & should be overlapping else Wound gaping & leakage

Principle 5

No Touch Technique



Use forceps to pull globe away without holding tissue

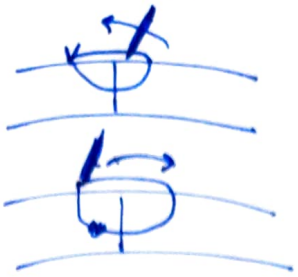
↓

Pass Needle ⊥ follow curvature

∴ less damage

Principle 6

suture knot buried



Beneath tissue
Away from visual axis
Superficially.

Topographical Considerations

a)



Circumferential incisions → flattens along the axis



Radial incisions → flattens 90° away

∴



Peripheral suture — flattens in periphery steeper in centre

Lowsey Hays Tech →



→ Periphery longer bites

- Pressure inside globe < Leaking pressure
- Use separate side port incision & suture them as well
- Check for Leak in the end.