Management of Canalicular injury

IC 132-Do's and Dont

Dr. Ravi Ranjan

Consultant

Awadh Medicare

Bikramganj, Bihar, India

Introduction

- Canalicular injuries are common in medial eyelid trauma (16-36%)

  Herzum H, Holle P, Hintschich C.Ophthalmologe 2001;98:1079 –1082

- Most injuries occur in young adult males- 83% (<30 years)
- Involve lower canaliculus (66.2%), upper (27.5%) & bicanalicular (6.3%).

  Kennedy RH, May J, Flanagan JC. Ophthal Plast Reconstr Surg 1990;6:46 –53.

- Primary repair- good outcome
- Repair should be done within 48 hours
- Successful repairs have been reported within 5 days of the injury

Why to repair monocanicular laceration?

- 0-25% have symptomatic epiphora when an isolated inferior canalicular laceration is not repaired

- The upper canaliculus drains 20-30% of tears when the lacrimal pump is functioning normally.

Kennedy RH, May J, Flanagan JC.Ophthal Plast Reconstr Surg. 1990;6:46-53

Etiology of Canalicular Lacerations

- Assault/Fight/Body contact injuries
- Motor Vehicle Crashes
- Fall to ground
- Sharp objects
- Blunt objects
- Hook-like objects
- Blouse hook fasteners(Indian context)

Selam Yekta Sendul et al. The Open Access Journal of Science and Technology 2015;3:115-120

Mode of canalicular injury

- Direct trauma to the canaliculus
- Indirect trauma to the canaliculus

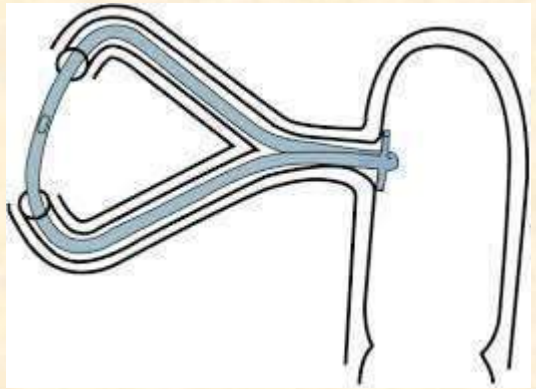
Techniques of repair for canalicular injury

- Direct Catheterization
- Retrograde Catheterization

Direct catheterization

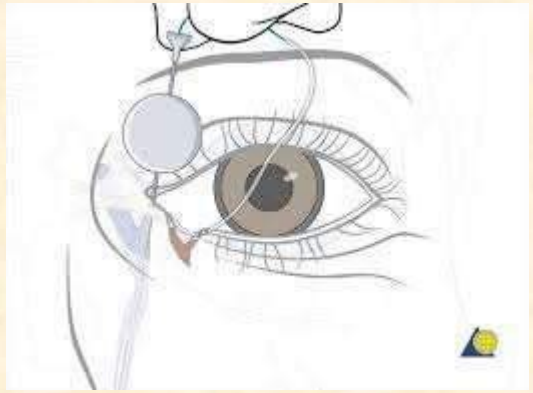
Bicanalicular Stent

- Crawford
- Ritleng
- O'Donoghue



Monocanalicular Stent

- Mini Monoka



Stenting materials

I.V canula

Retrograde catheterization

Pig tail Probe

Worst described “Pig tail” Probe for retrograde intubation

Useful in cases of monocanalicular tear

Disadvantages:

- Damage to the common or uninjured canaliculus.
- The risk of creating a false passage

Materials for canalicular stents

- Nylon
- Polyethylene
- Supramid
- Teflon
- Silicone

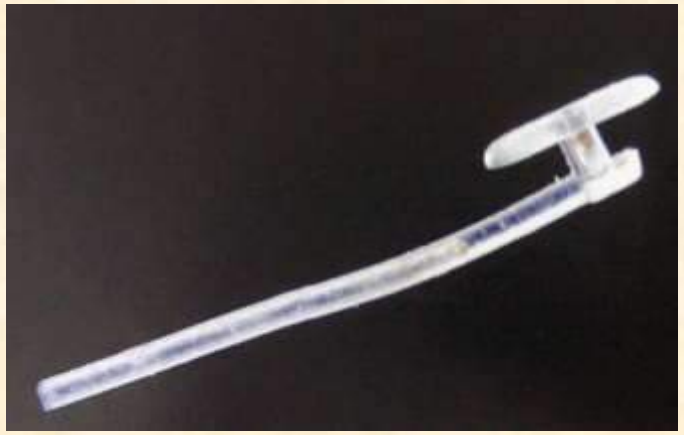
Naik MN, Kelapure A, Rath S, Honavar SG. Am J Ophthalmol. 2008; 145:375-380

Advantages of silicone Material

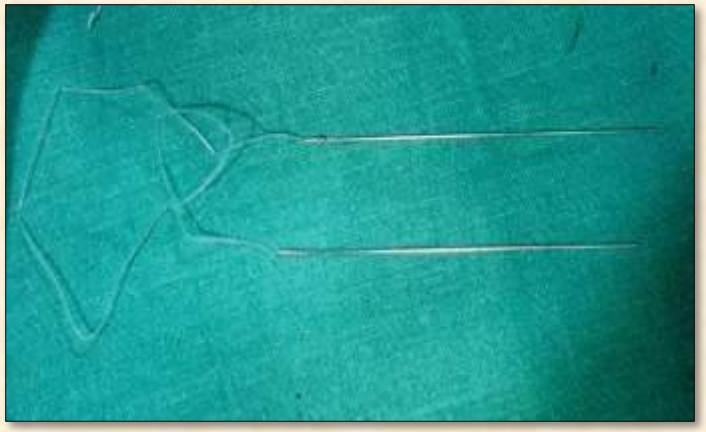
- Inert and Stable
- Soft, pliable silicone minimizes ocular irritation and tissue trauma
- Prevents stricture after repair
- Maintains proper alignment

Canalicular stents

- Monocanalicular (Mini Monoka stent)

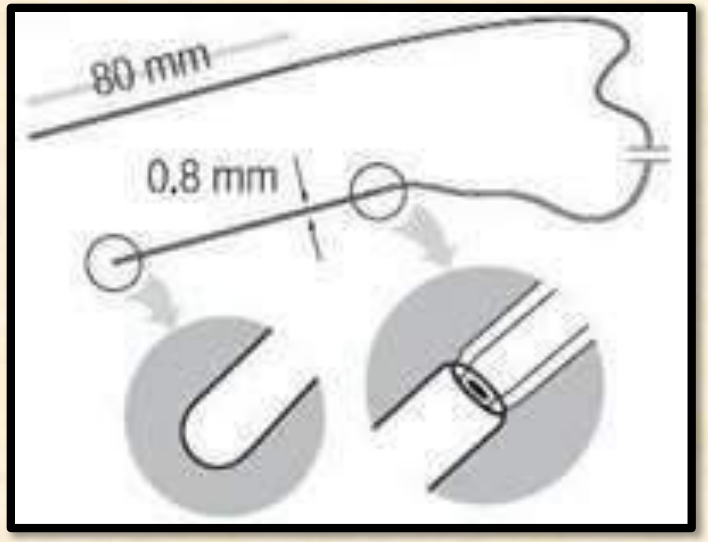


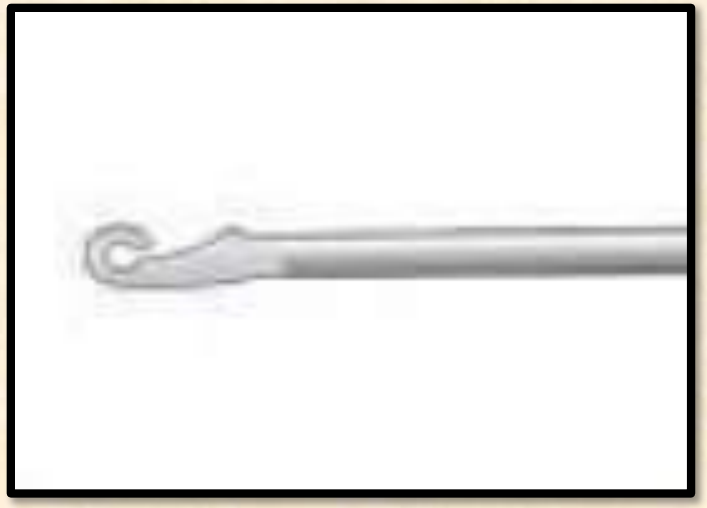
- Bicanalicular (O‘ Donoghue tube)



Bicanalicular stents (O' Donoghue's tubes)

- Silicone tube attached with metal rod at either end
- Passed through both canaliculi
- Retrieved beneath the inferior turbinate with hook





- Most commonly used in failed DCR surgery
- Can be an option for stenting in canalicular tears

Disadvantages:

- Cheese wiring of Punctum
- Canalicular slitting
- Granuloma formation
- Nasal irritation
- Superior loop dislocation

Mini monoka stent

- First developed by Dr Fayet from France

- 30-40 mm long silicone stent
- 0.64 mm outer diameter

- Self retaining

- Circular perforated collarette at one end connected to bulb via a small hollow tube

Other uses of Mini Monoka

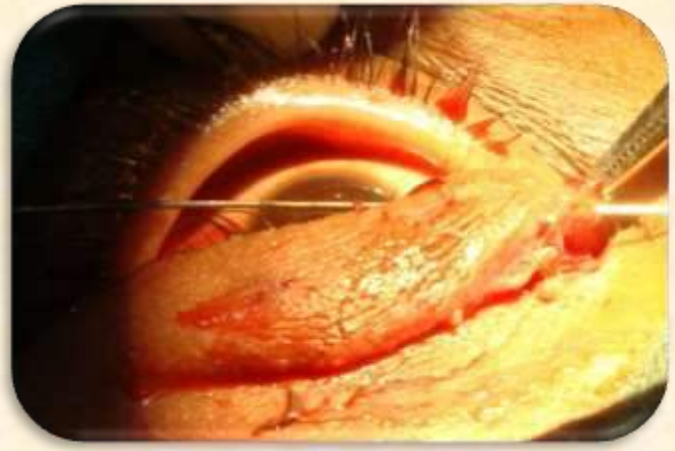
- Acquired punctal stenosis
- Proximal canalicular block
- Congenital Nasolacrimal duct obstruction

Advantages of Mini monoka stent over Bicanalicular stent

- Monocanalicular stent avoid manipulation of normal canaliculus
- Self retaining nature (no need of sutures)
- Non-irritant collarette
- Less traumatic passage and relatively more rigid nature
- Intranasal manipulation not required

Case 1

- 35 Year old male
- Right lower canalicular tear
- Assault by fist
- Repaired by Mini Monoka Stent



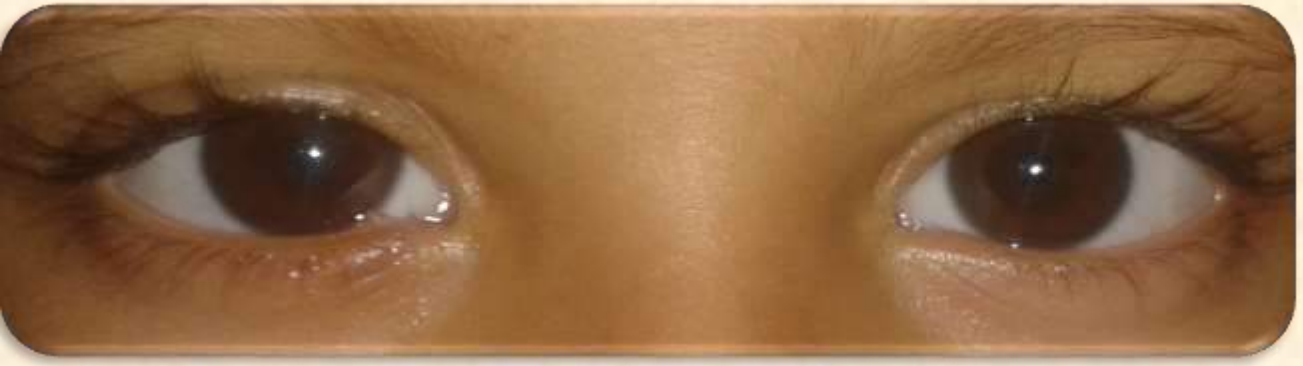
POD - 5

POD - 3 month

Case 2

- 3 year old child
- Right lower canalicular tear
- Trauma by metal bangles
- Repaired with Mini Monoka Stent

POD – Day 5



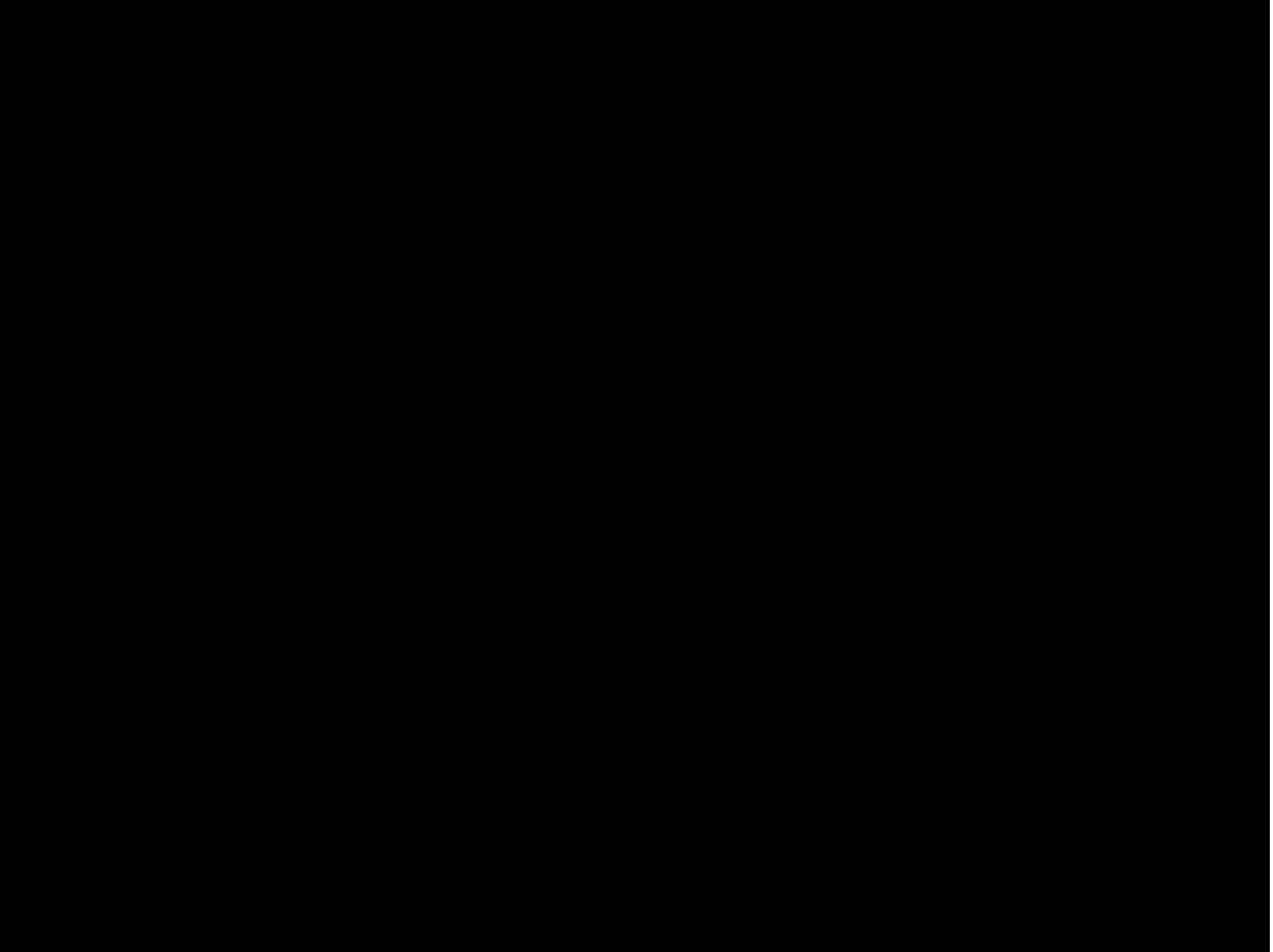
POD – 3 months

POD – 3 months

Case 3

- 9 year old child
- Left Bicanalicular tear
- H/O Fall from bicycle
- Repaired with two mini monoka

  stent on same day



POD Day 1

POD 1 month

POD 6 month

Outcomes

- Mini Monoka® stent has widely been used in repair of monocanalicular lacerations

- Naik et al reported premature stent extrusion in 11% in patients managed for canalicular lacerations but still the use of Mini-Monoka monocanalicular stent for monocanalicular as well as bicanalicular injuries achieved anatomical success in 90% of patients and functional success in 100% of patients.

Naik MN, Kelapure A, Rath S, Honavar SG. Am J Ophthalmol. 2008; 145:375-380

- Leibovitch et al reported no premature stent loss or stent migration . Functional drainage after stent removal was normal in 94.7% of patients.

Leibovitch et al . Ophthalmic Surg Lasers Imaging. 2010 Jul-Aug; 41(4):472-7

Conclusion

- One should assume that canaliculus has been cut if there is any injury extending close to the lid margin medial to the puncta of the eyelids.

- Canalicular injuries if repaired within 48 hrs lead to higher success anatomically as well as functionally.

- Mini Monoka® being a monocanalicular stent prevents undue manipulation/trauma to the other uninvolved canaliculus which is manipulated in standard bicanalicular silicone stents.

Thank You

CORNEAL TEAR REPAIR

Presenter: Dr. Prabhakar Singh

Associate Professor

All India Institute Of Medical Sciences, Kalyani

TERMINOLOGY & CLASSIFICATION

- To provide unambiguous and clear definitions for all types of injuries
- To have a standardized language for description of injuries in clinical practice
- For predicting prognosis

BERMINGHAM EYE TRAUMA TERMINOLOGY (BETT)

Term	*Definition and Explanation*
Eyewall	Sclera and cornea *Although technically the eyewall has three coats posterior to the limbus, for clinical and practical purposes, violation of only the most external structure is taken into consideration*
Closed globe injury	No full-thickness wound of eyewall
Open globe injury	Full-thickness wound of the eyewall
Contusion	There is no (full-thickness) wound *The injury is due to either direct energy delivery by the object (e.g., choroidal rupture) or the changes in the shape of the globe (e.g., angle recession)*
Lamellar laceration	Partial-thickness wound of the eyewall
Rupture	Full-thickness wound of the eyewall, caused by a blunt object *Because the eye is filled with incompressible liquid, the impact results in momentary increase in IOP. The eyewall yields at its weakest point (at the impact site or elsewhere; e.g., an old cataract wound dehisces even though the impact occurred elsewhere); the actual wound is produced by an inside-out mechanism*
Laceration	Full-thickness wound of the eyewall, caused by a sharp object *The wound occurs at the impact site by an outside-in mechanism*
Penetrating injury	Entrance wound *If more than one wound is present, each must have been caused by a different agent* Retained foreign object(s) *Technically a penetrating injury, but grouped separately because of different clinical implications*
Perforating injury	Entrance *and* exit wounds *Both wounds caused by the same agent*

OCULAR TRAUMA CLASSIFIACTION GROUP OPEN GLOBE INJURY CLASSIFICATION:

TYPE

A) Rupture
B) Penetrating
C) Intraocular foreign body
D) Perforating
E) Mixed

GRADE: Visual acuity

1) ≥20/40
2) 20/50 – 20/100
3) 19/100 – 5/200
4) 4/200 – PL+
5) No PL

ZONE

I) Isolated to cornea and limbus
II) Limbus to 5mm posterior into the sclera
III) Posterior to anterior 5mm

Visual acuity at initial examination: the most reliable predictor of final visual outcome in open globe injuries

Positive:

Negative: RAPD –

Pieramici DJ et al. A system for classifying mechanical injuries of eye. Am J Ophthalmol 1997;123:820-831

CORNEAL TRAUMA

- 2nd most common cause of corneal blindness in children
- Important cause of unilateral vision loss in developing countries
- Males: Females = 5:1
- More common in younger age group
- Psychological, economical implications apart from vision loss and cosmetic disfigurement

Dandona R, Dandona L.Corneal blindness in a southern Indian population: need for health promotion strategies. Br J Ophthalmol 2003 Feb;87(2):133-41

GOALS OF INITIAL ASSESSMENT

- Recognition of emergent systemic conditions
- Identifying extent of ocular involvement
- Presence of foreign body
- Assess need for imaging & Formulate initial therapeutic plan

HISTORY

- Mode, duration, object of injury
- Medico-legal Aspect
- Medication and intervention done after injury
- Known eye disease and previous eye surgeries- RK, LASIK, cataract surgery, Scleral buckle
- Visual Acuity before trauma

HISTORY

- Known systemic illness
- Tetanus Immunization status
- Allergies
- Last Meal

EXAMINATION

- Ensure stability of systemic status

Ocular Examination

- Unaided and pinhole visual acuity, PR
- Pupillary reaction to light, consensual light reflex
- Eyelid laceration, obvious foreign body, peri-orbital ecchymosis, enophthalmos
- Extra-ocular movements
- Palpation of orbital margins

EXAMINATION

- Extent of corneo-scleral laceration
- s/o occult scleral tear
- Seidel's test: Occult full thickness corneal tears
- Foreign body
- Uveal tissue prolapse, vitreous loss, cataract, phacodonesis, iris transillumination defects
- Infiltrate in cornea

INVESTIGATIONS

- X-ray / CT : To rule out foreign body, to rule out associated cranial, orbital or facial trauma
- USG B-scan (gentle): To rule out IOFB, status of posterior capsule of lens, assessment of posterior segment
- UBM: anterior segment foreign bodies
- Corneal Scraping: Infected wound (scraping from margins of wound), devitalized tissue and FB

PRE-OPERATIVE MANAGEMENT

- Admit
- Eye shield
- Do Not Instill any topical drop or ointment in OGI
- Analgesic medications
- Broad spectrum oral/intravenous antibiotics
- Inj. Tetanus toxoid
- Fasting for 6 hours for general anesthesia

PRE-OPERATIVE MANAGEMENT

- Counseling of patient in relation to primary aim of surgery, need for multiple surgeries, visual potential, endophthalmitis
- Severe injuries- possible need for enucleation, consent

STEPWISE APPROACH

Primary aim	• Complete water-tight closure of the globe
Secondary aim	• Avoidance of uveal tissue and iris incarceration Removal of necrotic tissue debris • Removal of disrupted lens and removal of IOFB
Tertiary aim	• Visual improvement • Prevention of complications

NON-PERFORATING (LAMELLAR) CORNEAL TEAR REPAIR

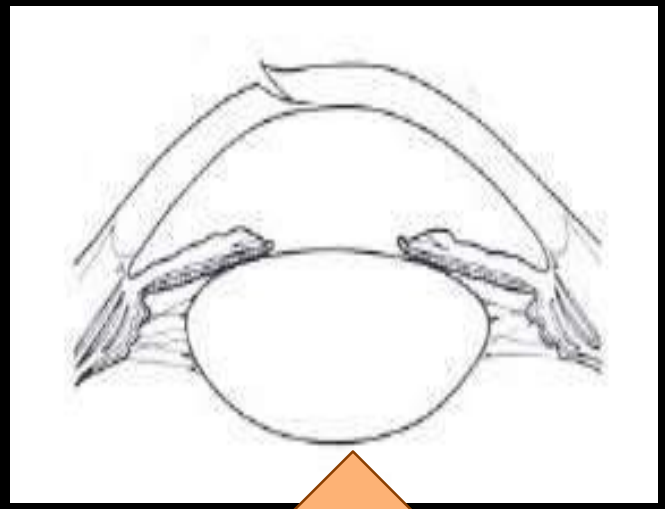
- Seidel's test

Treatment goal:

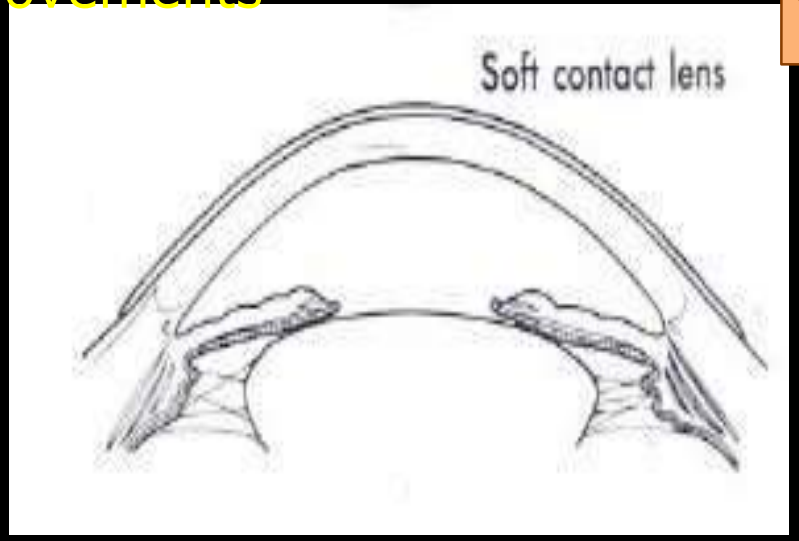
- Promote re-epithelization, stromal healing
- Prevention of infection
- Reducing corneal irregularity and minimizing corneal scarring

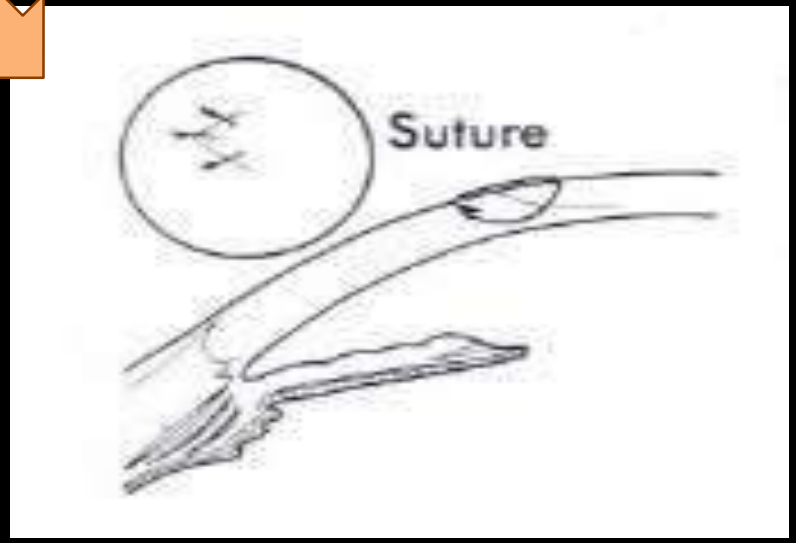
NON-PERFORATING (LAMELLAR) CORNEAL TEAR REPAIR

- BCL=Prophylactic antibiotic
- BCL – splinting effect, re-epithelization, protection from lid movements



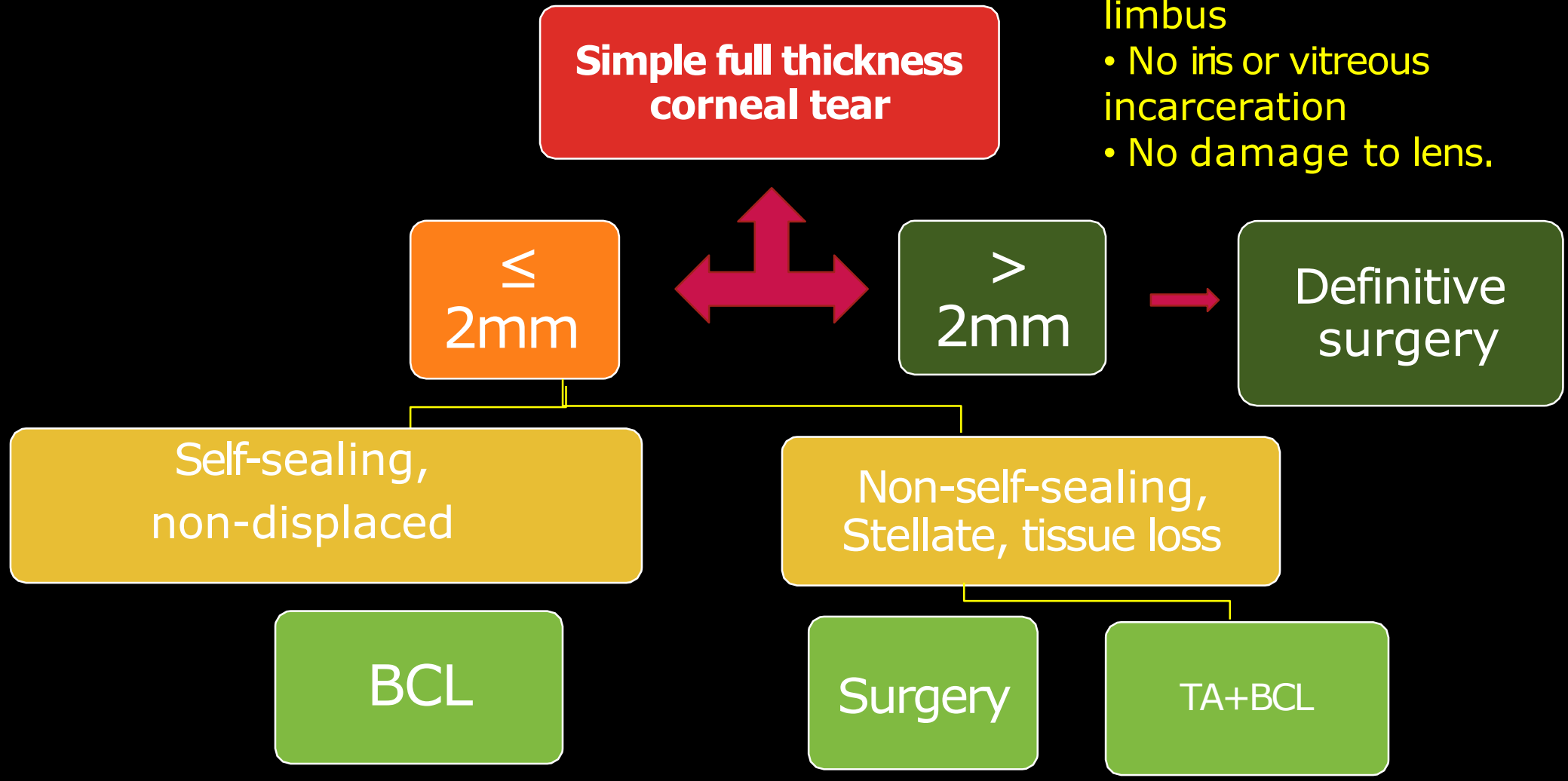
Suture in long lamellar wounds
or significant gape, over-ride





Full-thickness corneal tear

- Wound not involving limbus
- No iris or vitreous incarceration
- No damage to lens.



INDICATIONS OF BCL/ TA+BCL

Indications for BCL

Lamellar partial thickness tear with good edge apposition

Simple self-sealing wounds ≤2 mm

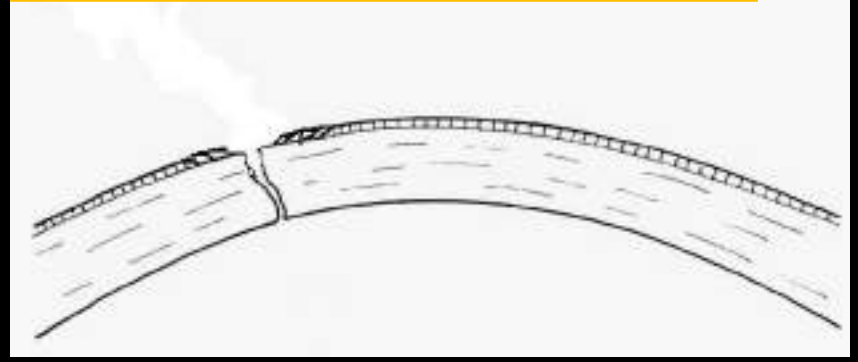
Indications of TA+BCL

Simple, Short lacerations (<2mm)

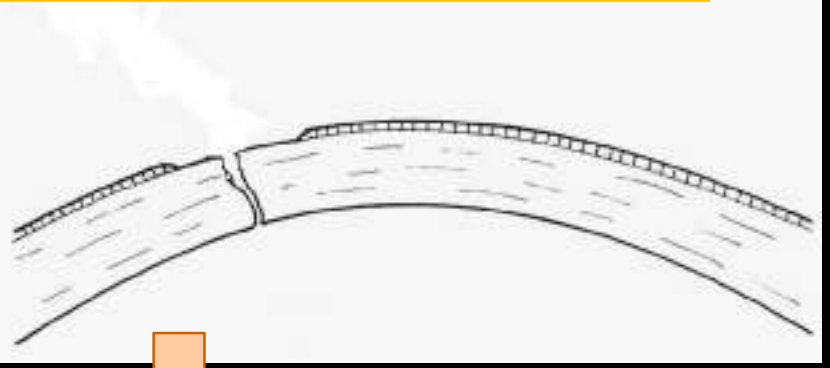
- Non self-sealing
- Tissue loss

PROCEDURE

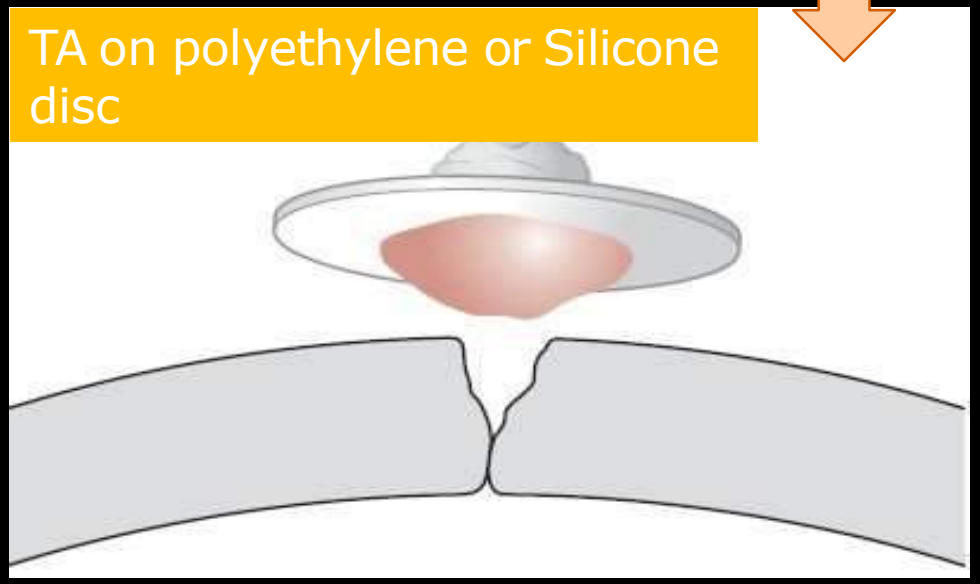
Non-self sealing full thickness tear



Surrounding epithelium removed



TA on polyethylene or Silicone disc



INDICATIONS FOR SUTURING THE LACERATION

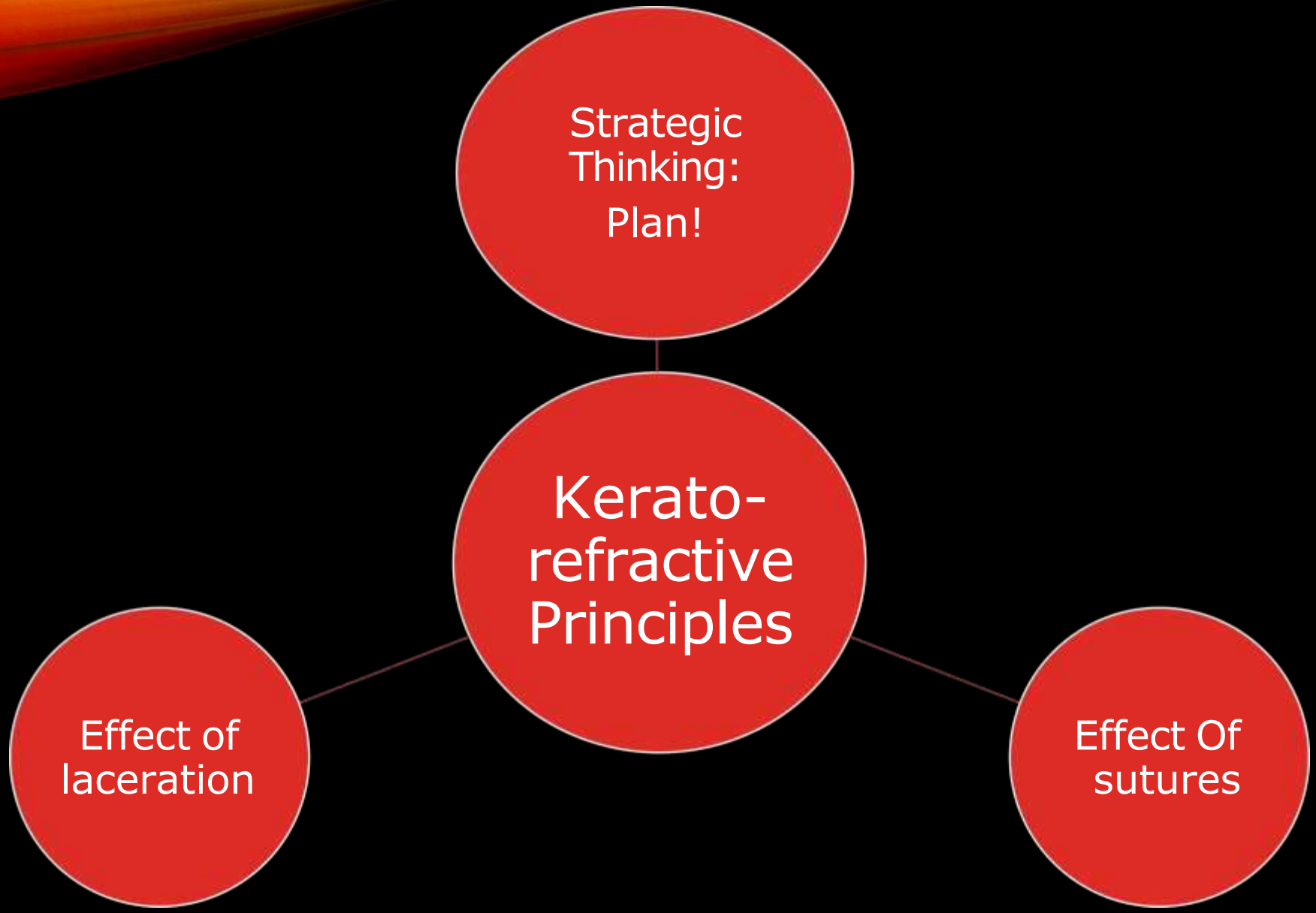
- All full thickness tear > 2 mm
- All full thickness complicated wound < 2mm
- Children, uncooperative, mentally challenged

Judicious use of relatively conservative modes of management

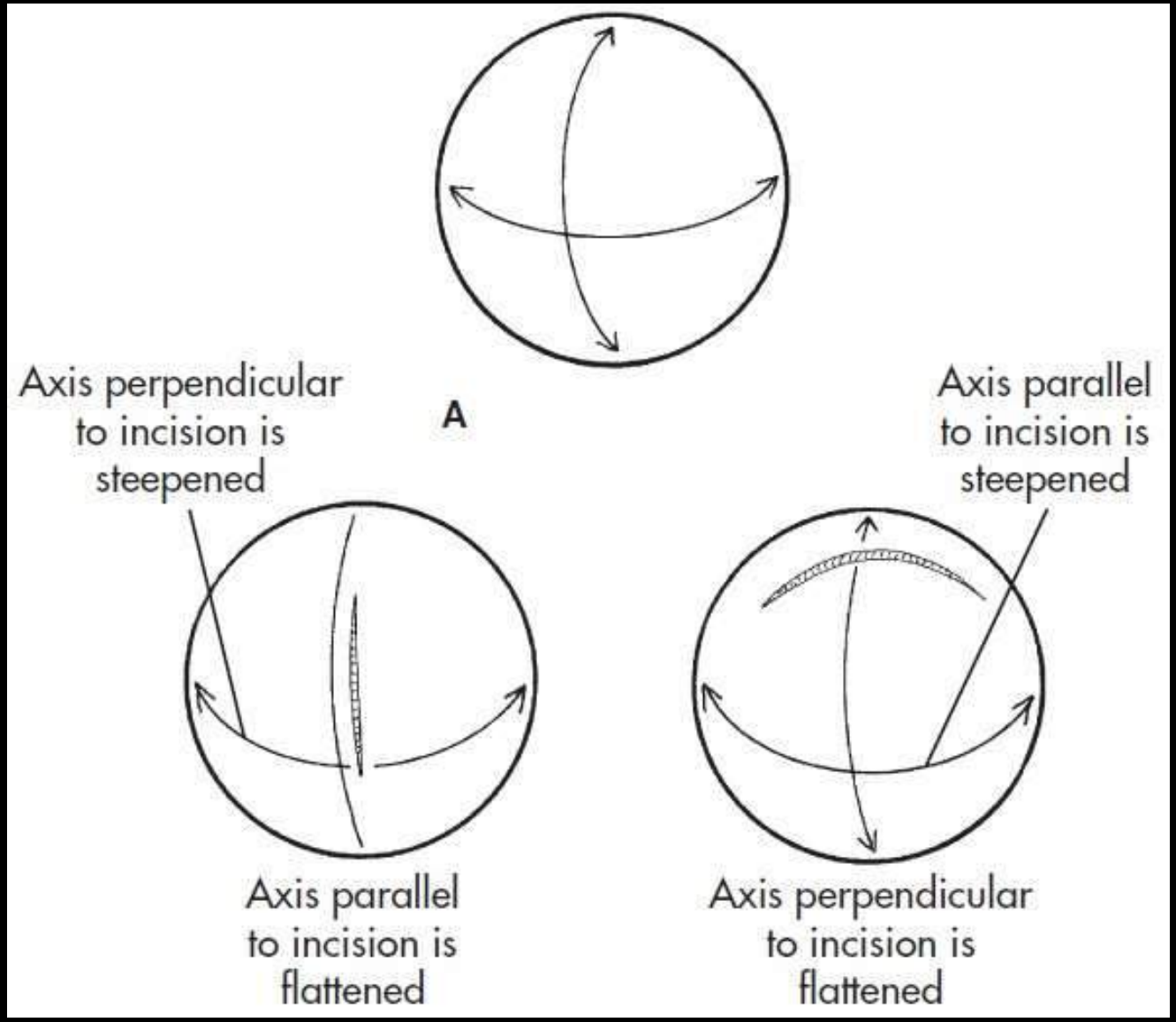
Never compromise on primary aim of achieving integrity of the globe

SURGERY PROCEDURE

- GA
- Peribulbar: Careful block, no massage
- Careful lid speculum insertion / Lid retraction sutures
- Side-port entry away from tear to form and maintain AC (with air / OVD)
- Monofilament 10-0 Nylon, Spatula-design needle

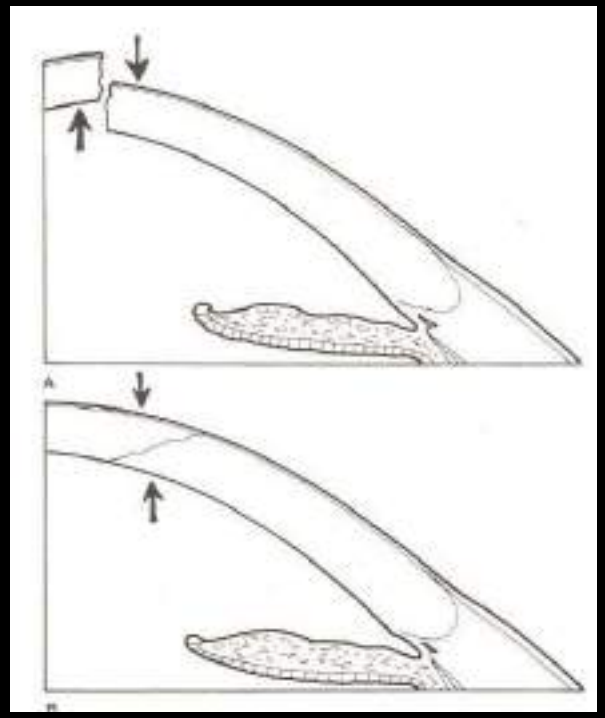

Strategic Thinking:
Plan!
Kerato-refractive Principles
Effect of laceration
Effect Of sutures

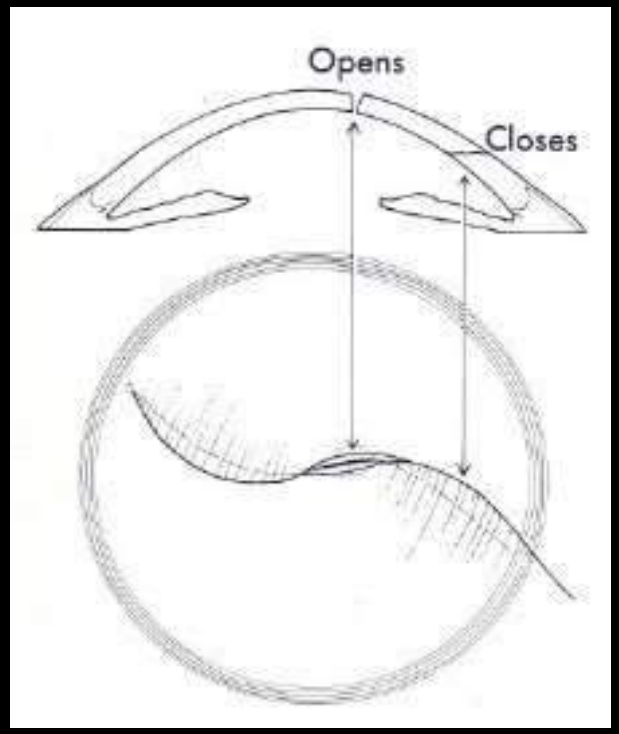
EFFECT OF LACERATION



VALVE RULE OF EISNER

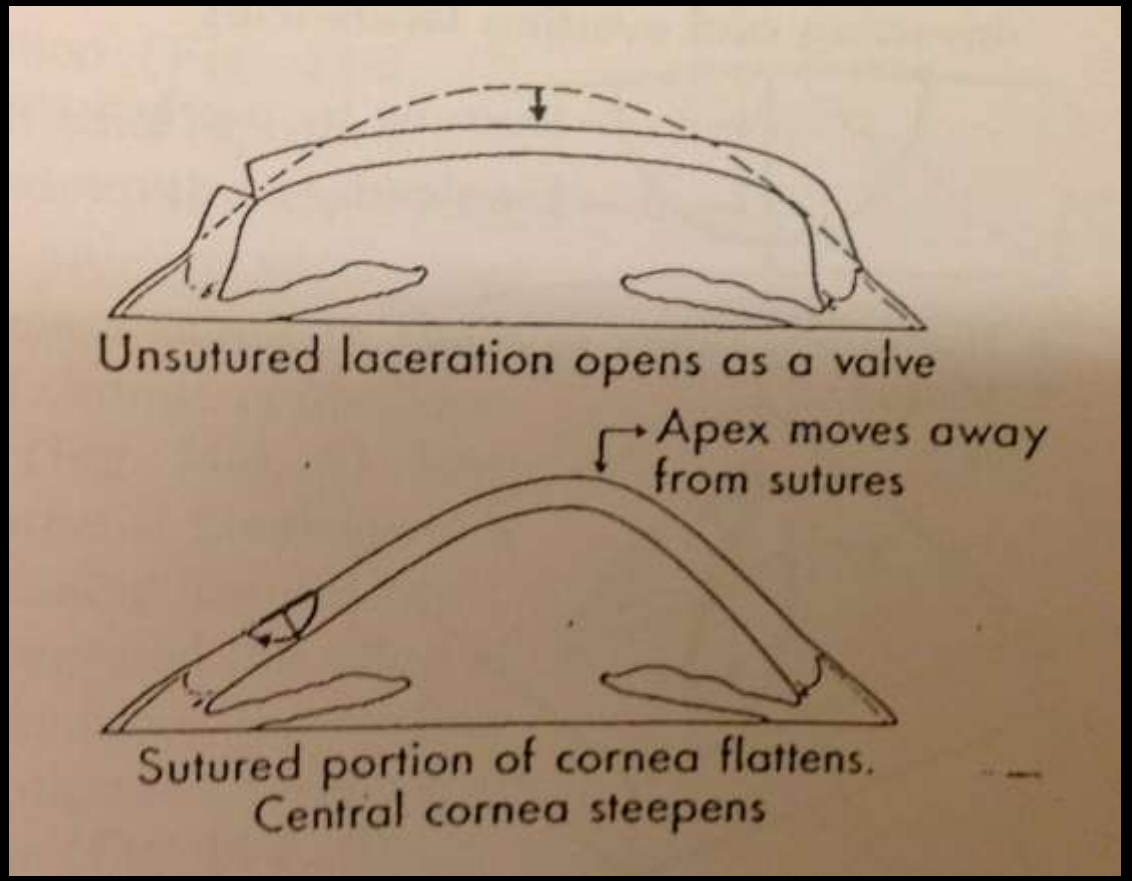
- Incisions through the wall of globe produce valves whose margin of water tightness is equal to the projection of surface incision onto the surface of the globe.”
- Bevelled incisions: less gape
- Perpendicular incisions: gape



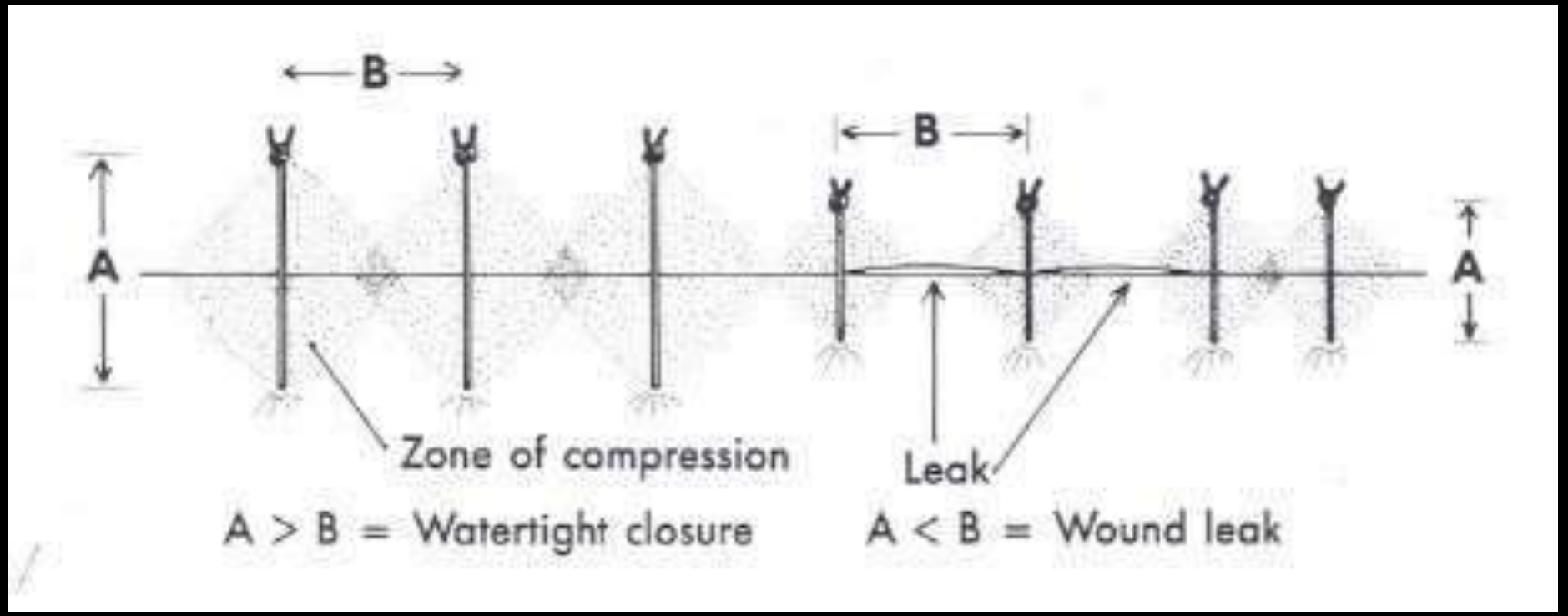


EFFECT ATTRIBUTABLE TO SUTURES

- The sutures flatten in the area where they are applied and cause the cornea in the centre and nearer to the visual axis to steepen

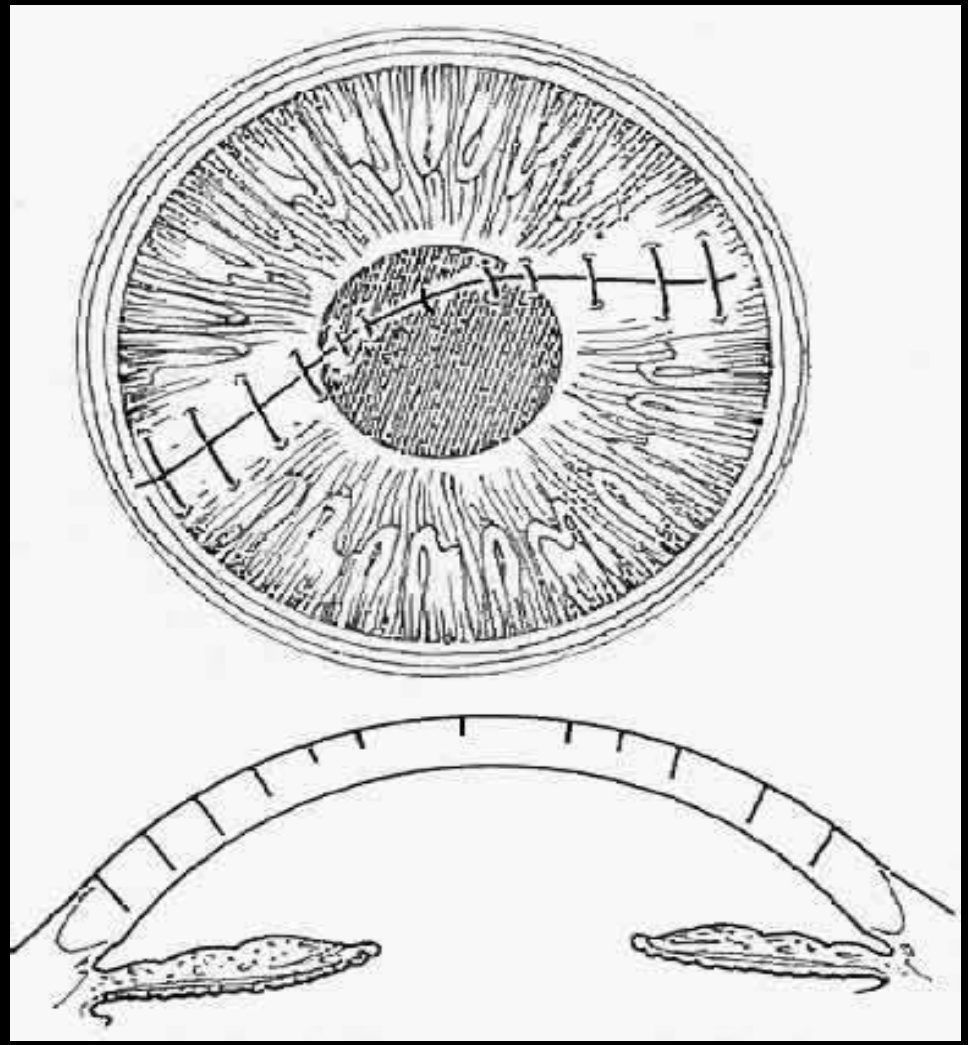


ZONE OF COMPRESSION

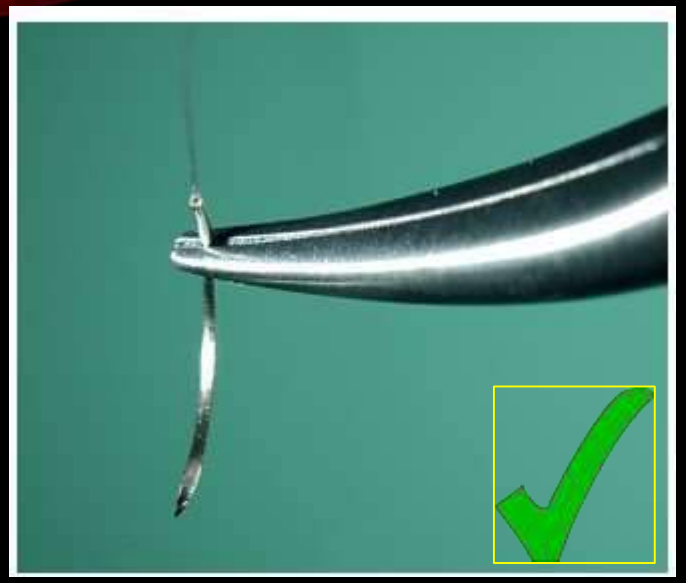


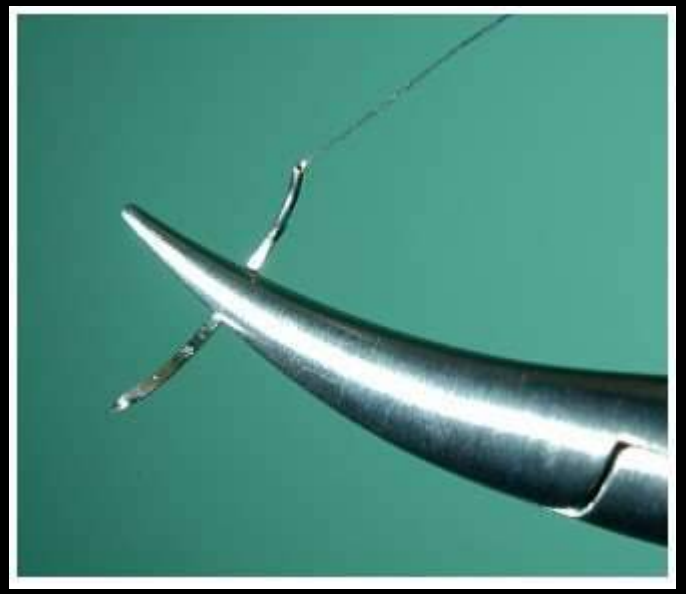
ROWSEY–HAY'S TECHNIQUE

- Longer sutures: greater tissue distortion and astigmatism
- Long, tight compressive sutures: corneal periphery
- Shorter, more widely spaced minimally compressive sutures in the center



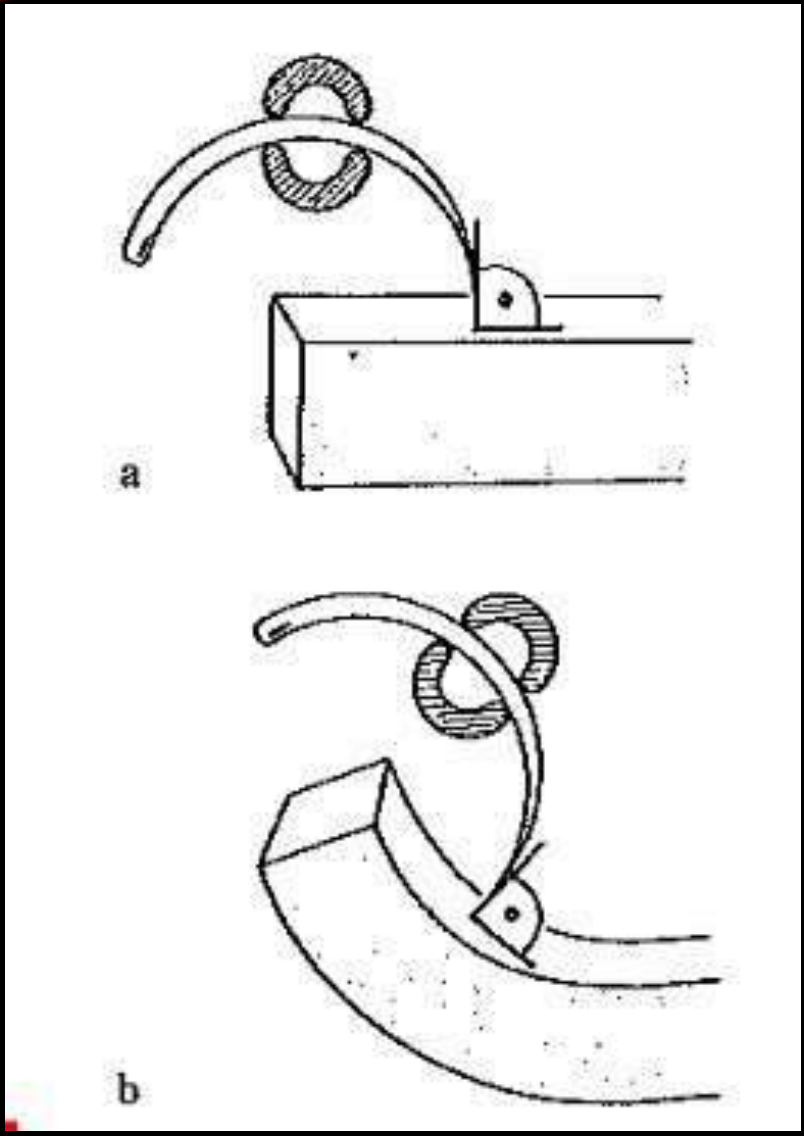
HOW TO HOLD NEEDLE





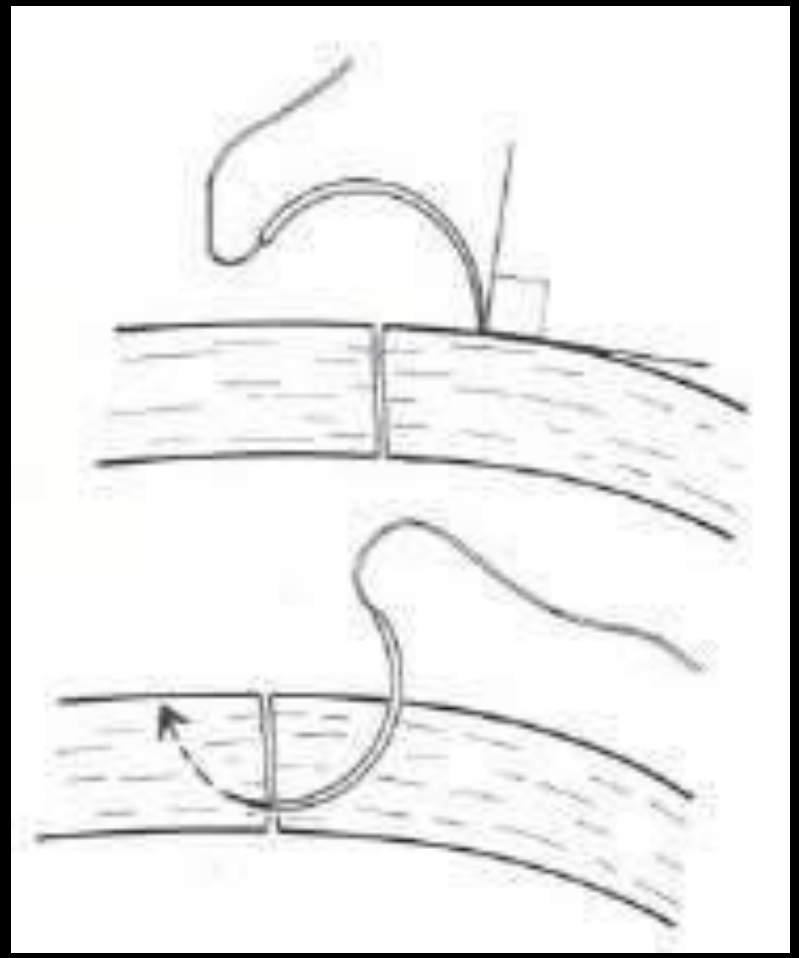
- Hold the needle at the junction of lateral 1/3rd and medial 2/3rd
- Equal tissue (1.5-2mm) on either side
- Enter perpendicular to the wound
- Depth: 90%

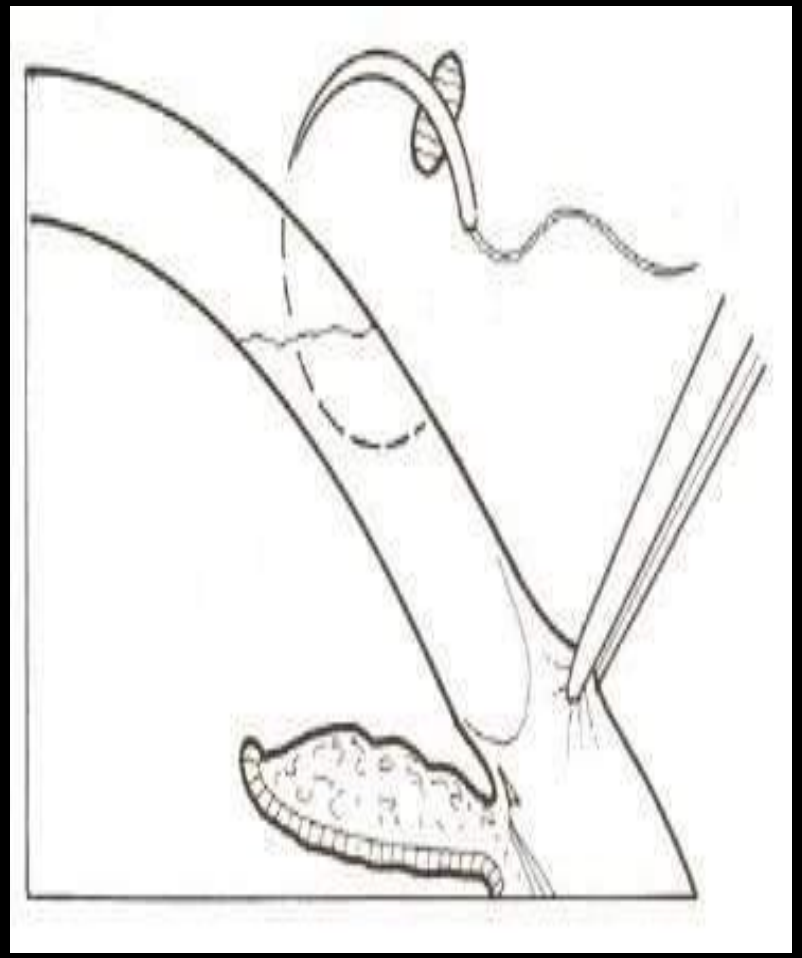
MANEUVERING THE NEEDLE



- Keep needle tip perpendicular to the tissue
- Adjust needle tip according to the lifted tissue (more upright)

NO TOUCH TECHNIQUE





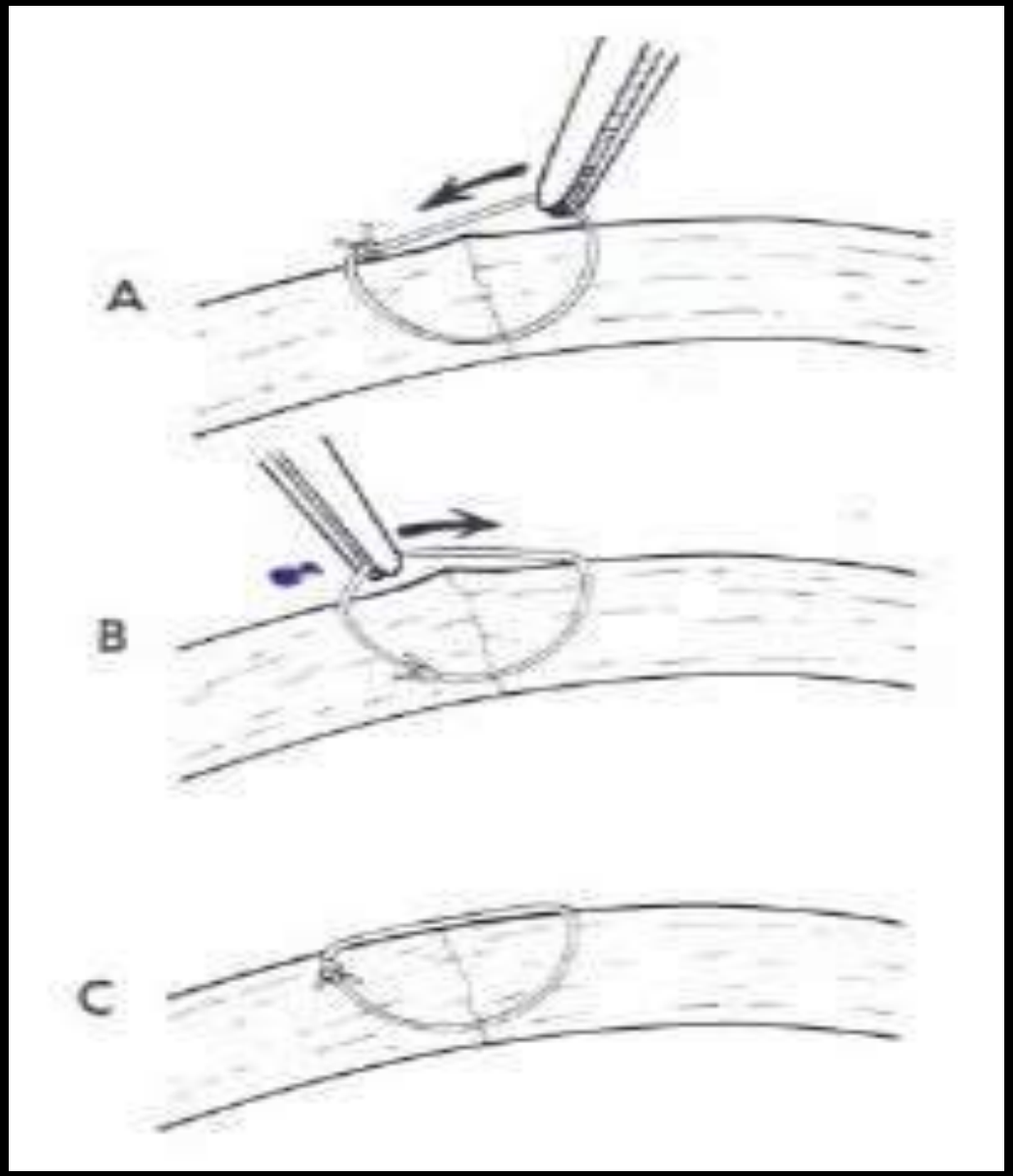
Tying the Knot

- Knot: small enough to be easily buried but strong enough to prevent release or loosening

- The ideal knot has three throws:
  - 1st : Triple, tightened after the surgeon crosses hands
    Tightening is perpendicular to the wound's plane
  - 2nd: Single, tied parallel to the wound's plane
  - 3rd: Single, tied perpendicular to the wound's plane

- All knots must be buried since they can cause severe inflammation/ irritation

TECHNIQUE OF KNOT BURYING

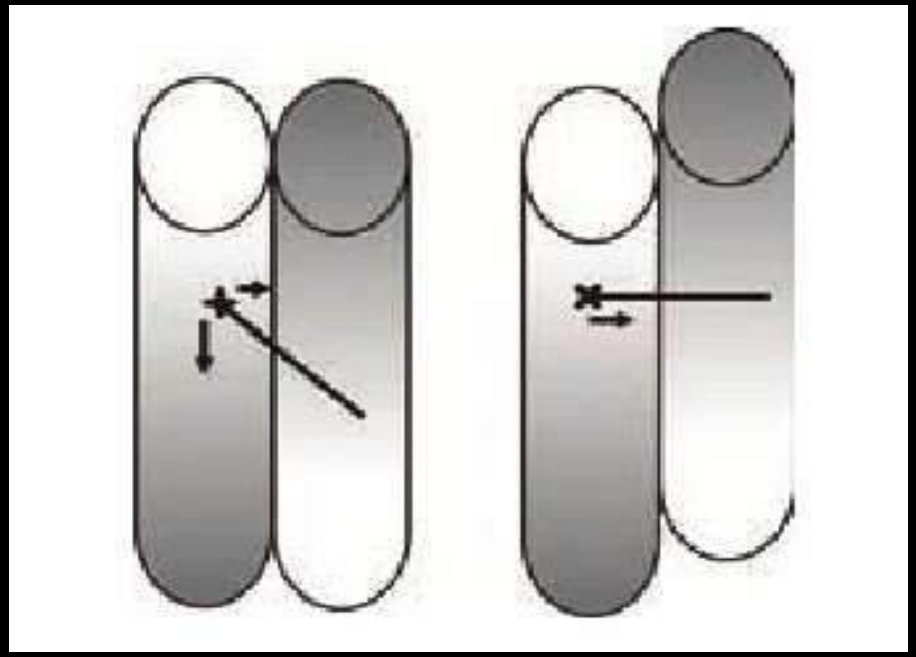


PERPENDICULARITY OF SUTURES

- Corneal sutures: perpendicular to the lacerations
- Oblique sutures: Tissue torque and wound slippage,

↓

Wound gape and leakage

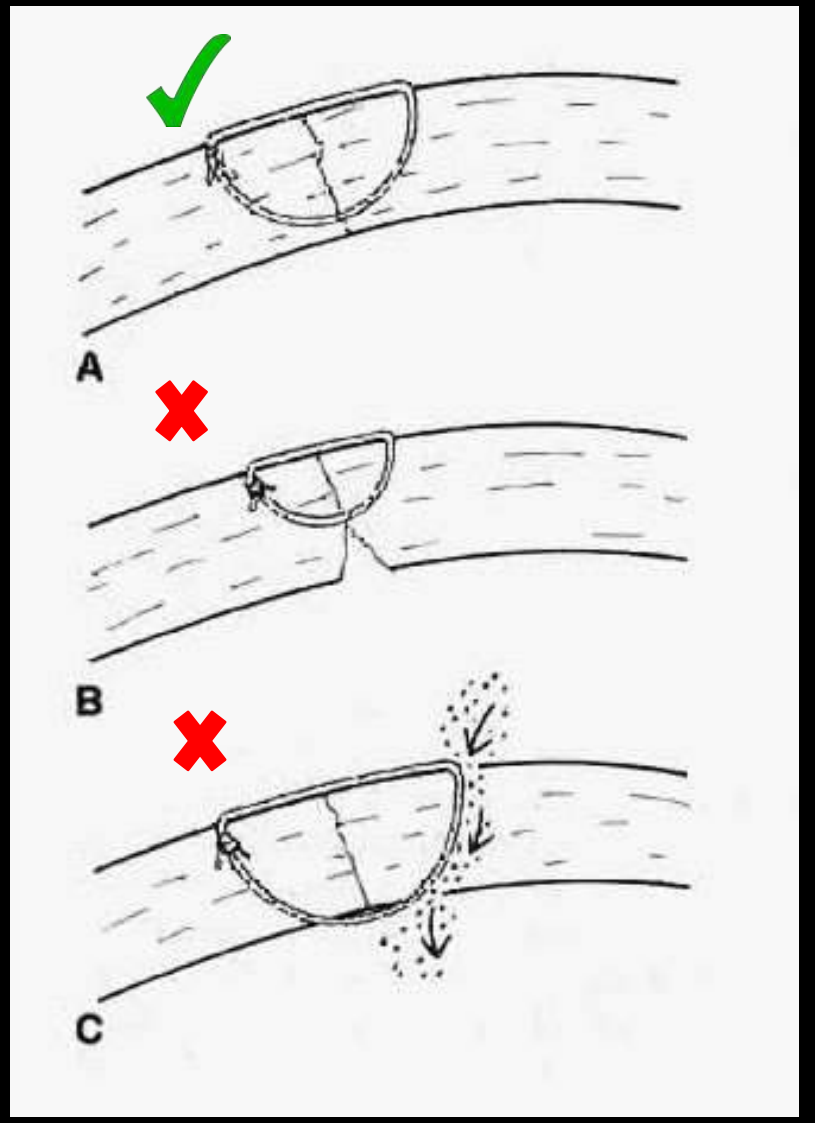


DEPTH OF SUTURES

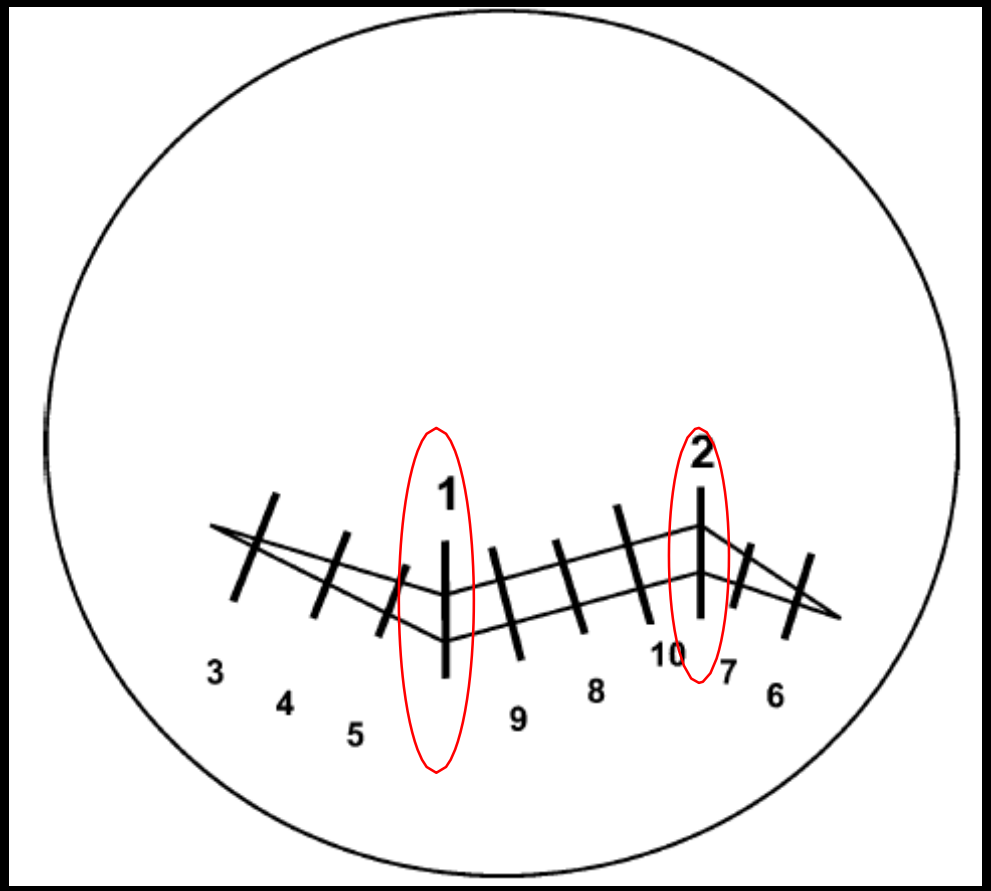
Optimum: 90% corneal depth

- If superficial suture:
  - Suture length becomes shorter than expected
  - Iris tissue can adhere to gaped posterior margin

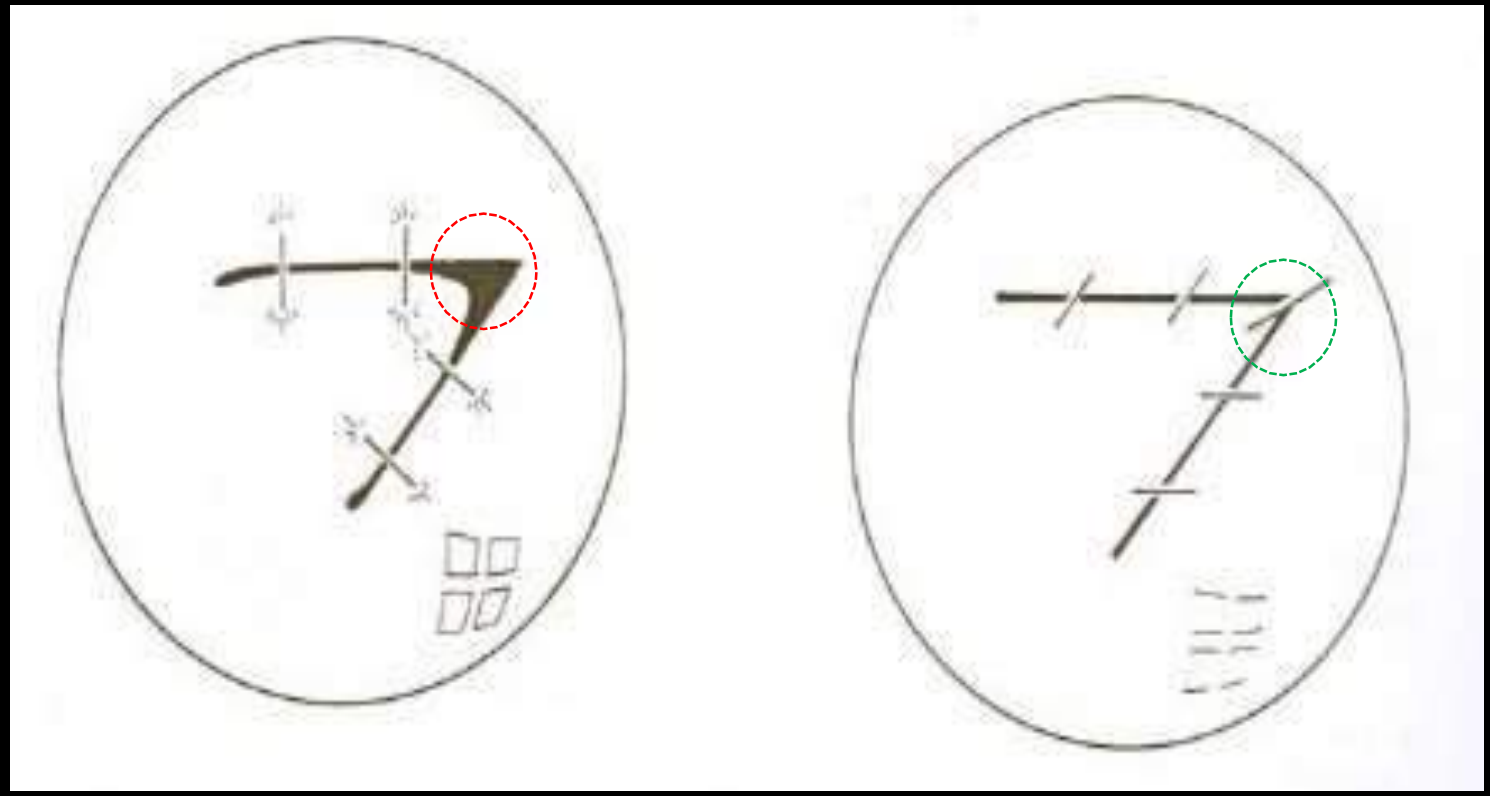
- If 100% depth:
  - Forms track for infection
  - can cause leak
  - epithelial ingrowth in AC



SEQUENCE OF SUTURING

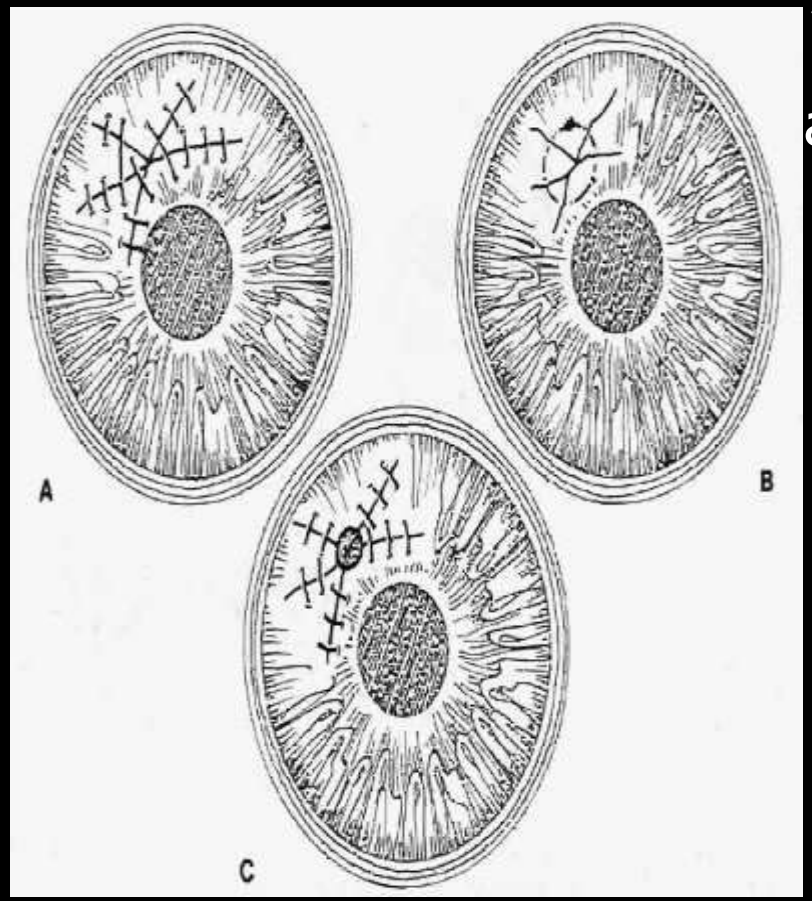


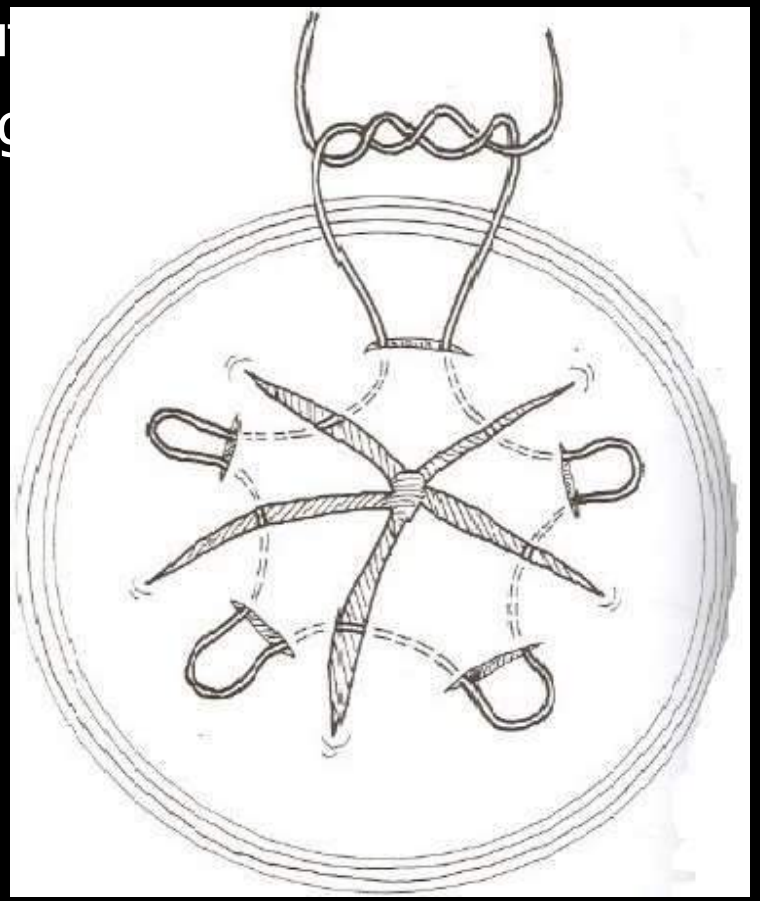
TRIANGULAR FLAPS



STELLATE LACERATIONS

- ‘X’ su
- atch g





CORNEAL TISSUE LOSS

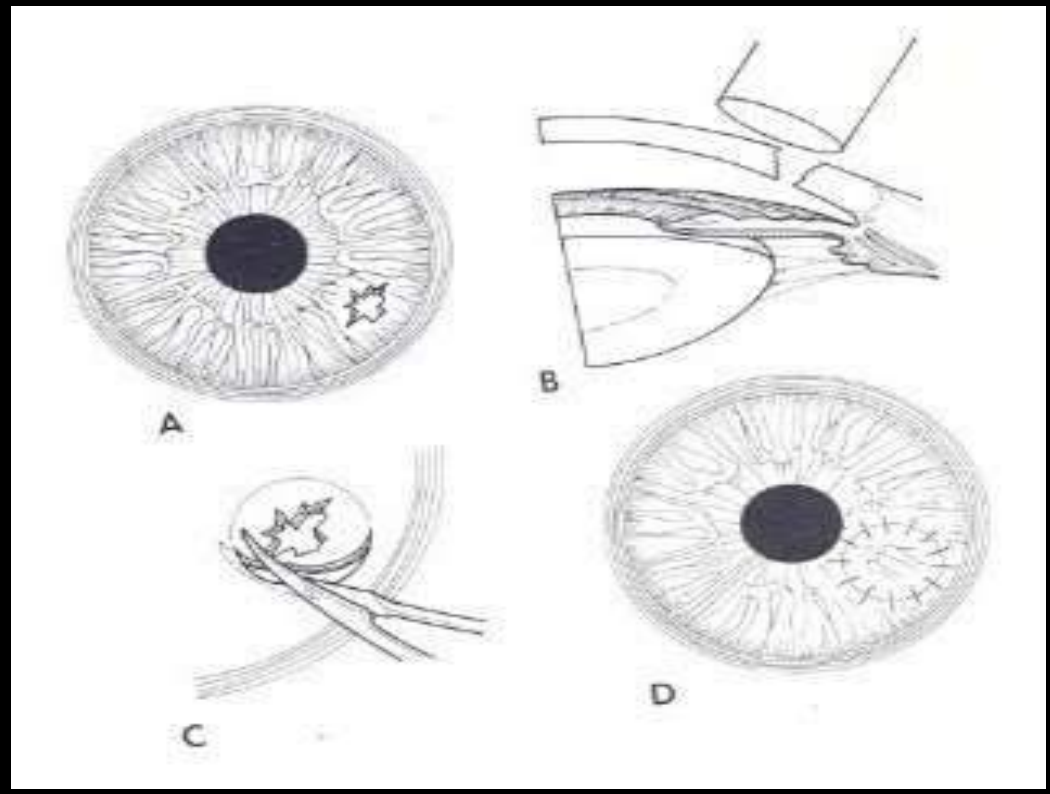
- Tissue loss causes significant reconstructive problems

- Tissue loss ≤5mm:

  Trephined / freehand patch graft from donor cornea

- Tissue loss >5mm:

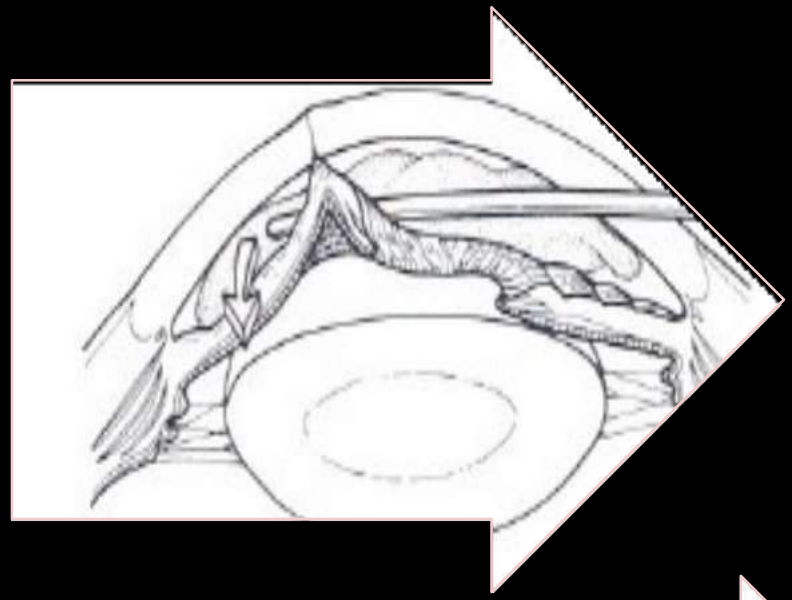
  Primary corneal transplant



IRIS INCARCERATION/IRIS PROLAPSE

Iris adhered to corneal wound tear: healthy, vascularised iris tissue,

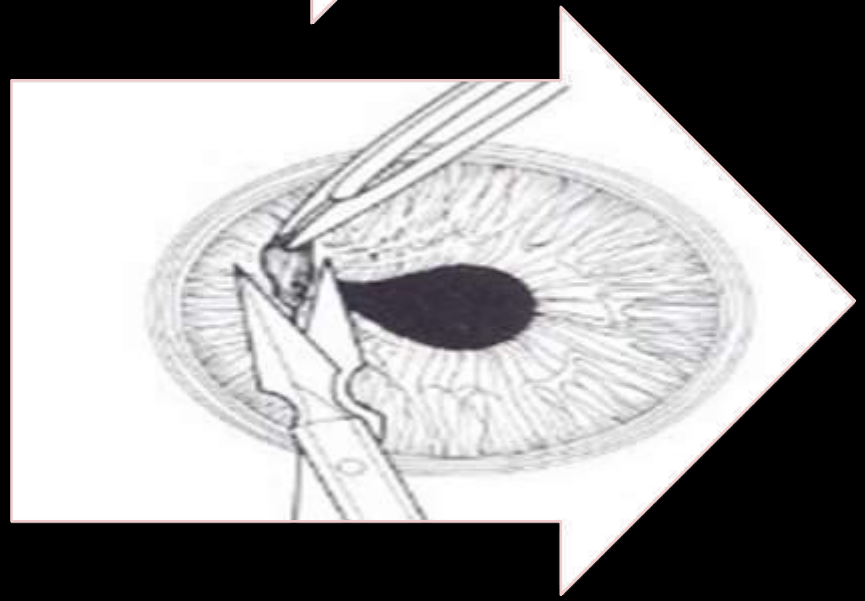
<24 hours



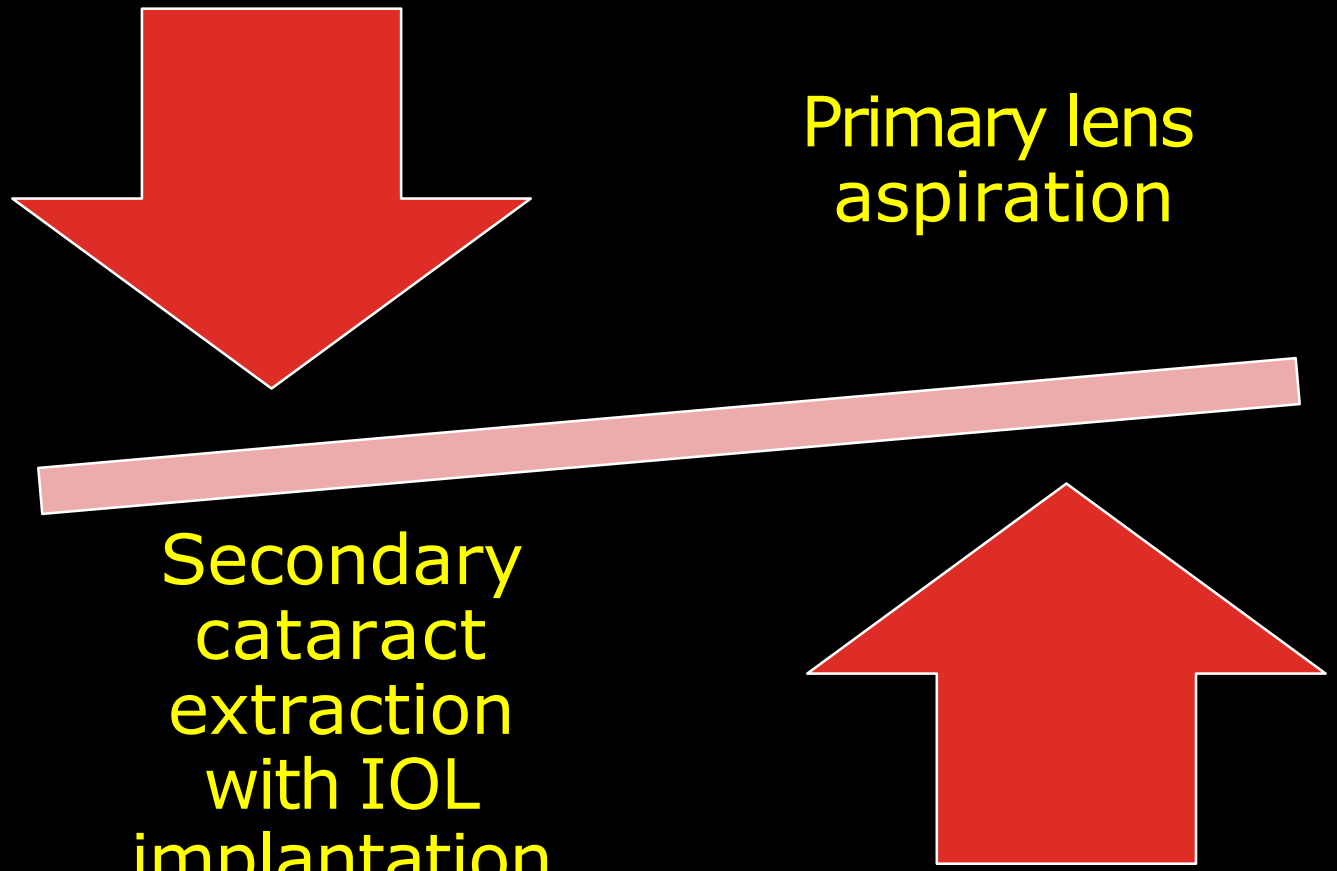
Devitalized, macerated, feathery, depigmented,

>24 hours

Abscission



LACERATION WITH DAMAGE TO LENS



SECONDARY CATARACT REMOVAL

- Cataract surgery should be deferred until the eye has recovered from the initial effect of primary surgical repair
- Allows for corneal wound healing, IOL implantation and better visual rehabilitation

INDICATIONS OF PRIMARY LENS ASPIRATION

Injured lens capsule & lens matter in AC

Opaque lens with no view of fundus: IO FB

Complete dislocation of lens in AC

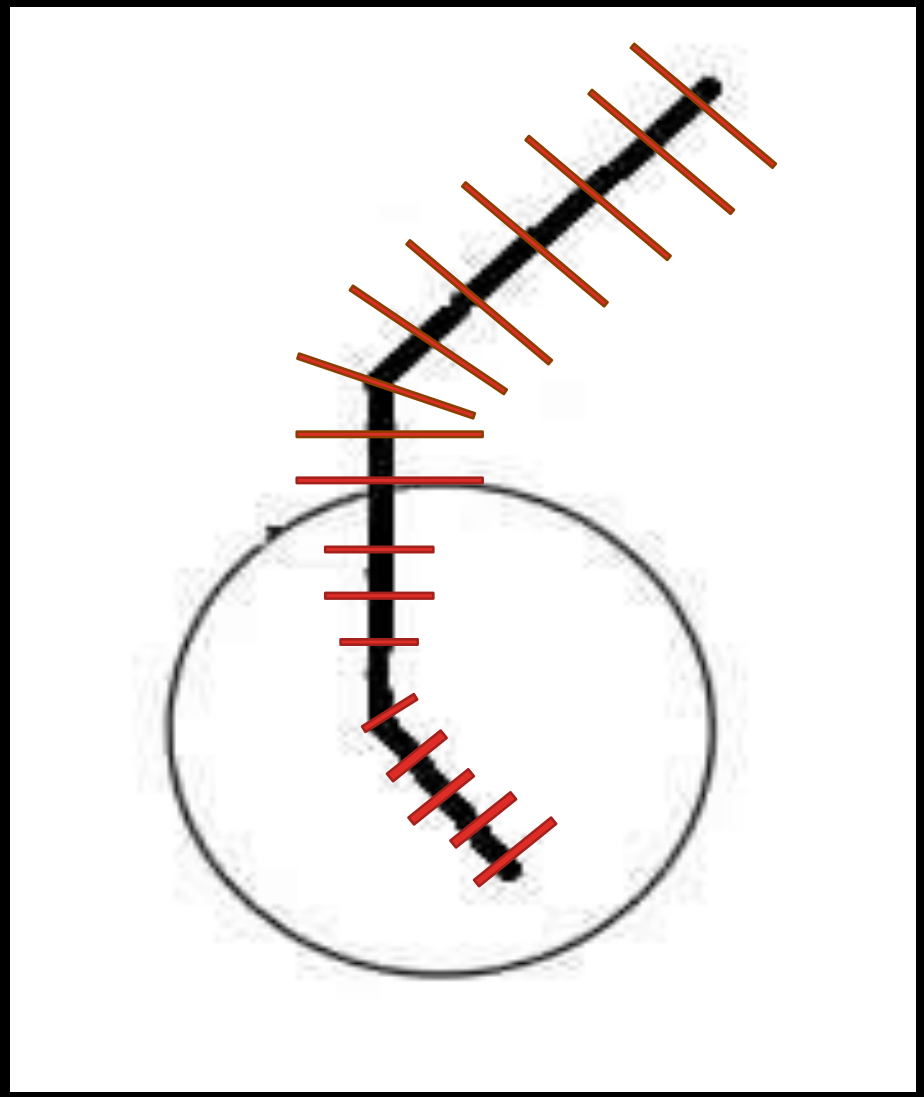
COMBINED CORNEO-SCLERAL TEAR

1st suture to be placed at the limbus, to restore the normal anatomic contour of the globe.

Then the corneal wound should be repaired as highlighted previously

Lastly the scleral wound should be approached gradually from the anterior to the posterior aspect as far posterior as possible

SUTURING SEQUENCE



POST OPERATIVE CARE

- Treatment:
  - Systemic: Analgesics, Broad spectrum antibiotics
  - Topical: Antibiotics, Cycloplegics, Steroids

- Deterrence/Prevention
  - Defer sports, bike riding, etc.
  - Protective eyewear at all times

Eye lid laceration:

Do,s and Don,t

Dr(Prof) Sudhir Kumar

MD;DNB;MNAMS

HoD, Govt. Medical college: Bettiah

No financial interest

Evaluation

- Any eye lid injury should be seen in larger perspective, not in isolation
- Associated/ suspected structural damage must be explored to assess the overall injury
- All facial injuries bear cosmetic and medico legal implications
- Radiological help must be taken to rule out any foreign body and associated fracture

Primary care

- Never try to forcibly open the eye, as it may be harboring perforated globe. Open in OT under GA/LA
- Once associated systemic and ocular involvement have been ruled out, eye lid repair can be carried out on elective basis within 24 hours. Another 12-24 hour can be taken until initial edema subsides.
- Dirty wounds can be taken after cleaning/disinfection. Vaccination status of the patient should be evaluated and proper steps should taken.

Referral

- Referral should be done only after giving primary care--

-- Cleaning and debridement of the wound

-- Primary stay stitches can be applied for logical apposition

-- Antiseptic dressing and vaccination should be done.

-- Preventive antibiotics should be started

-- Drying of the wound margin should be avoided

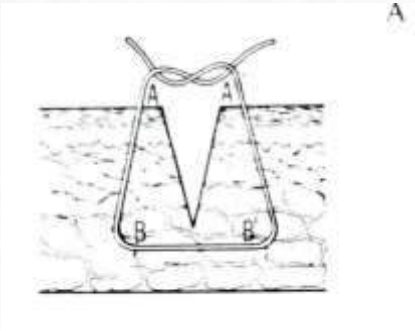
-- When more skill is needed: flap rotation, Cutler Beared

Eye lid margin repair

- Success of eye lid repair depends on proper placement and satisfactory suture tension.
- Post operative notching of the margin should be avoided by giving good standard stitches.
- If edges are ragged, freshen them with sharp blade. Pentagonal defect is created.
- Palpebral conjunctiva should not be repaired to prevent corneal abrasion.
- Frost stitches should be given at the end.

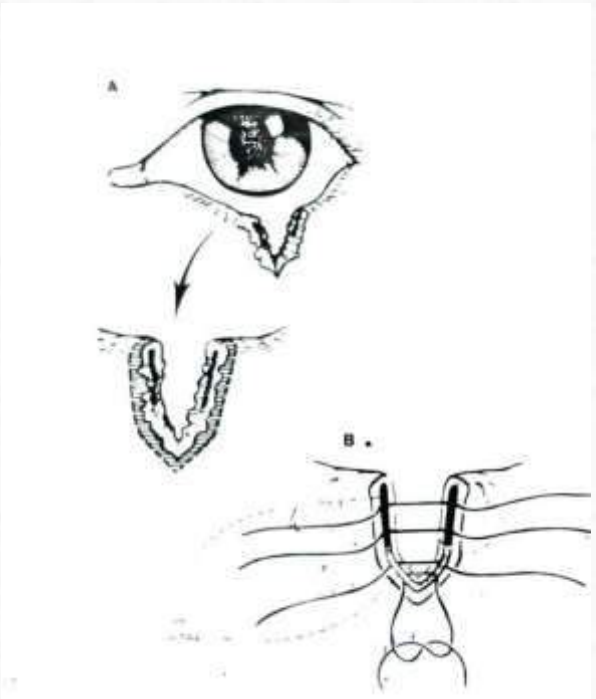
Superficial laceration

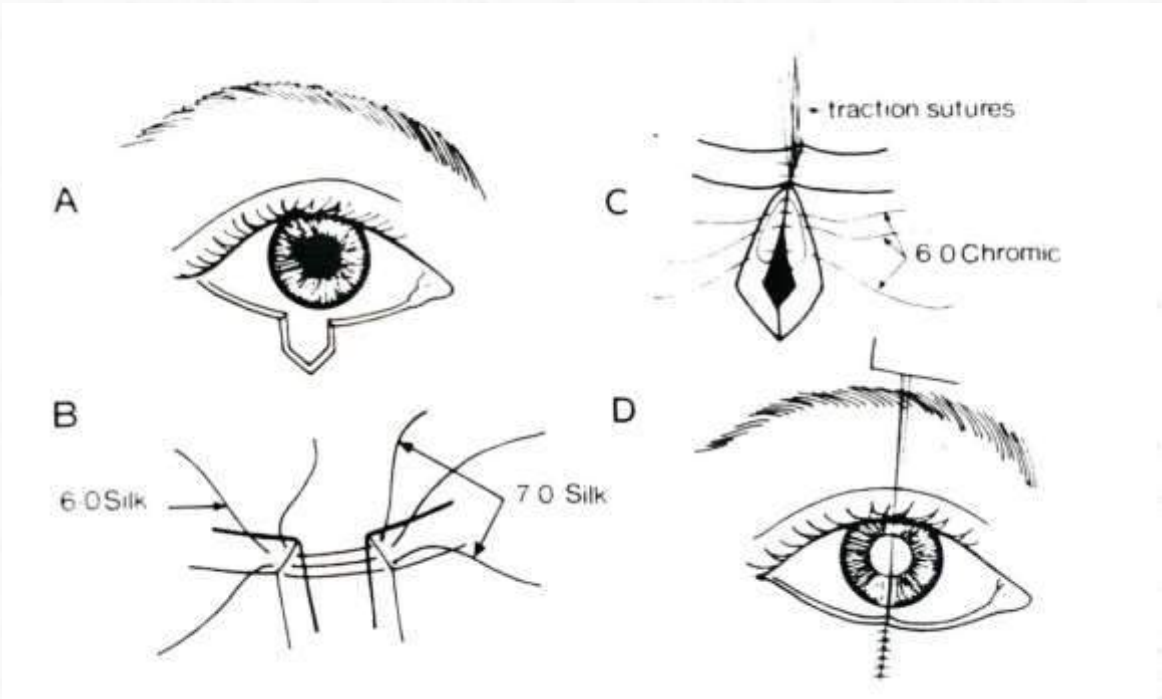
- Smallest caliber suture should be used. Cutting needle. Natural or synthetic.
- Final wound edges should be slightly everted.



Deep laceration

- Meticulous Search for any foreign body: exploration and radiology
- Explore and evaluate for levator and orbital septum
- A lacerated aponeurosis/ muscle should be isolated and carefully repaired. Secondary ptosis should not be repaired before 9-12 months of injury.
- Fat in the injury suggests septal rupture and it should be repaired. But, a care should be taken not to include in the repaired wound, lest lagophthalmous will occur in down gaze.


A
B


A
B
6 0 Silk
7 0 Silk
C
traction sutures
6 0 Chromic
D

Lid injury without tissue loss: Direct closure

Pictures:Courtsy
Dr Sitesh Vats

Lid injury with tissue loss

- When the tissue loss is up to

  25%-- Direct closure is possible

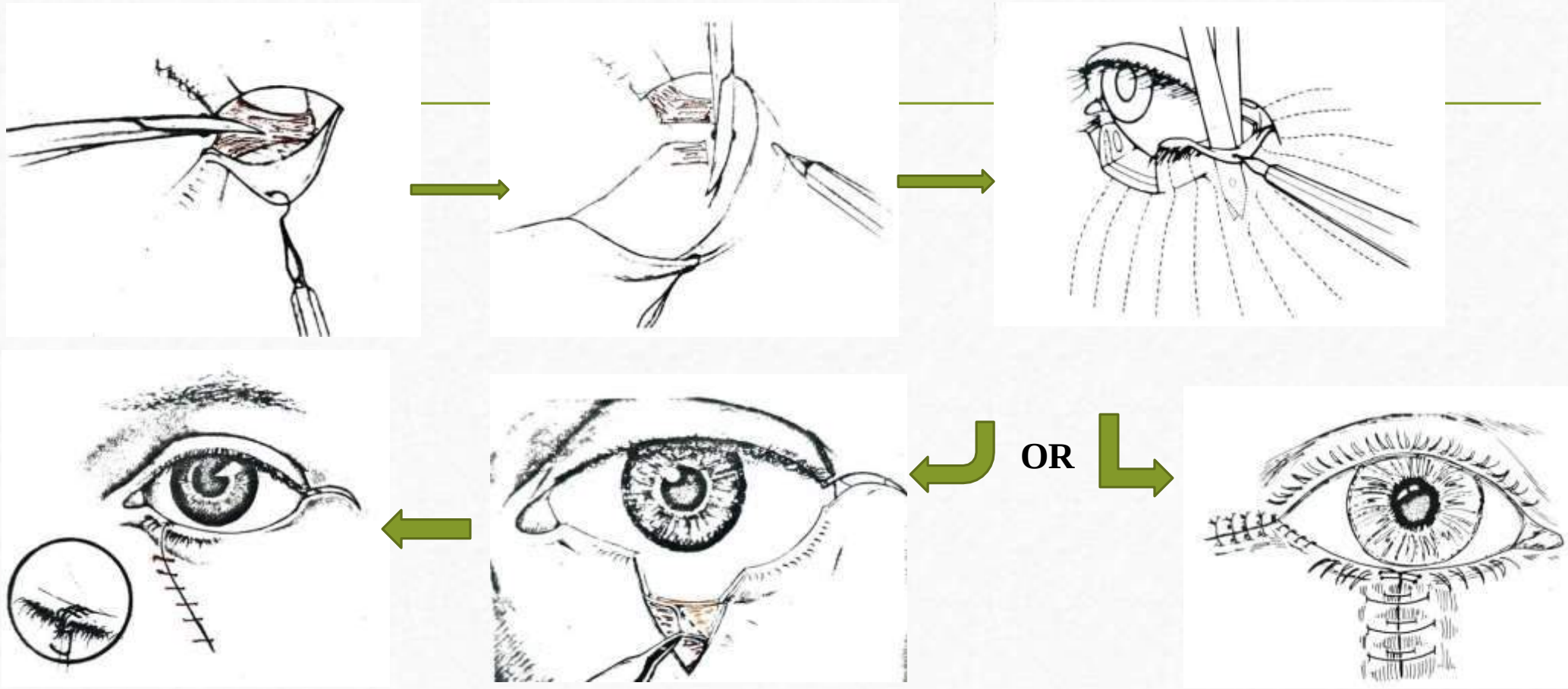
  25-40%--lateral cantholysis with direct closure

  40- 70%-- Flap roatation: Tenzel

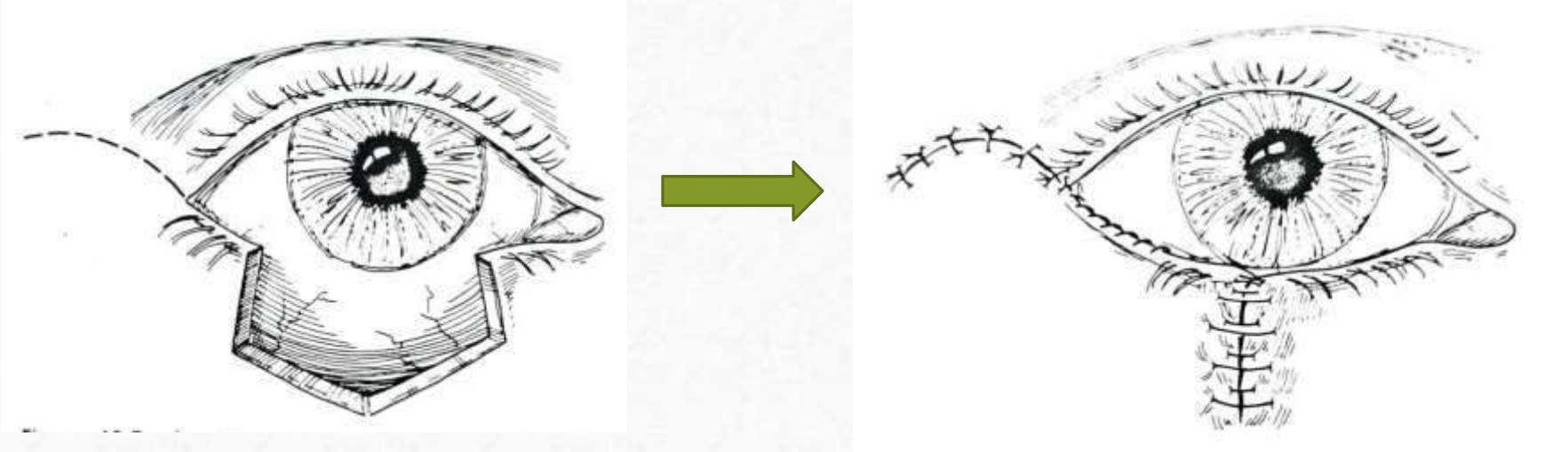
  more than 70%-- Upper lid: Cutler Beared

  --Lower lid: Mustardee’s

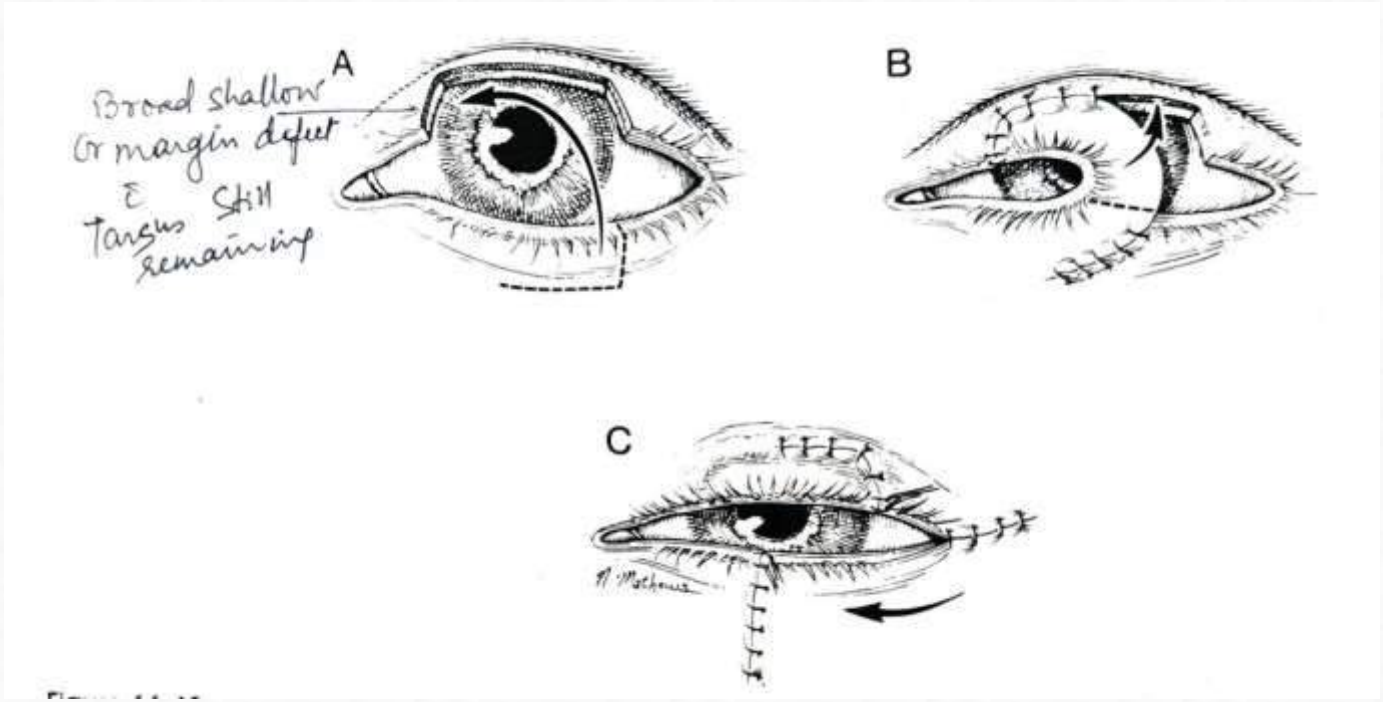
Cantholysis with direct closer



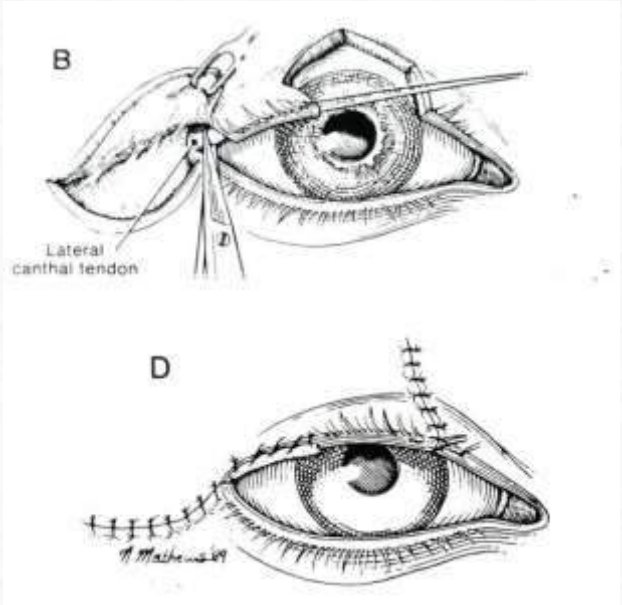
Tenzel flap rotation



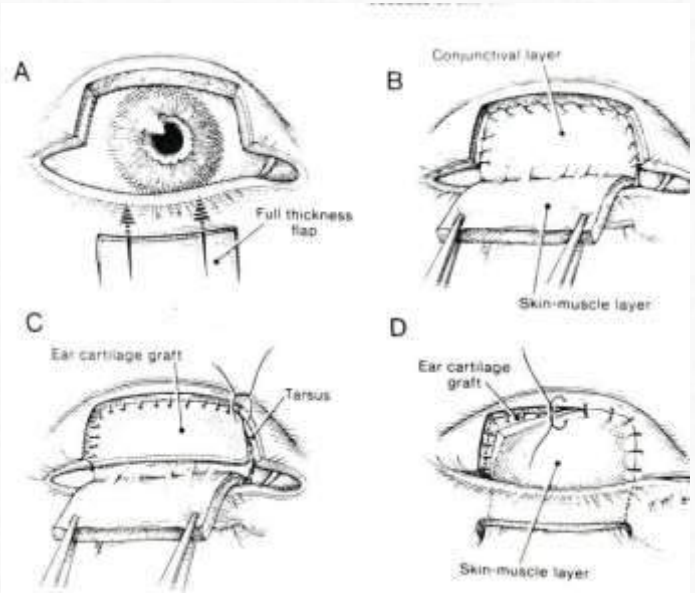
Upper lid defect with tarsus still present



Upper lid defect with tarsus missing: Tenzel flap rotation or Cutler Beared



Tenzel flap rotation

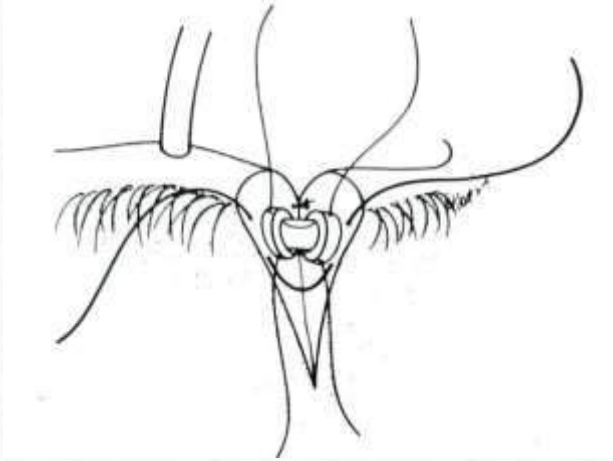


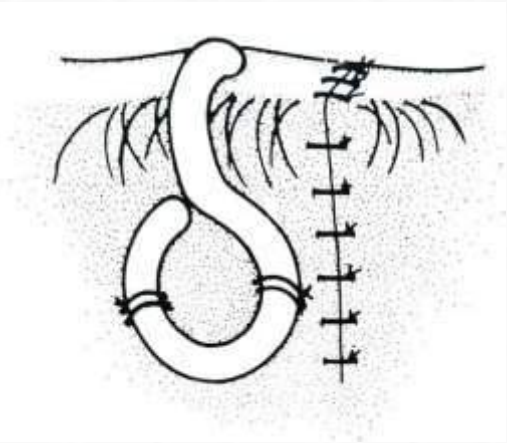
Cutler Beared

Canalicular injury

Material used

- Mini monoka
- 24 G IV canula
- 0.7 mm thick fishing nylon line
- 2-0 monofilament nylon suture





Thank you!

DO’S AND DON’T IN OCULAR YRAUMA: HOW TO MAXIMIZE OUTCOME

Orbital Trauma

DR GYAN BHASKAR

PROFESSOR,

RIO, IGIMS, PATNA

EFFECTS OF ORBITAL TRAUMA

- Orbital fractures
- Orbital haemorrhages
- Orbital foreign bodies
- Orbital emphysema
- Globe luxation

CLASSIFICATION OF ORBITAL FRACTURES

1. Fractures limited to orbital skeleton (isolated)

➢ Pure Blow-out Fractures

➢ Impure Blow-out Fractures

2. Fractures of orbit associated with other fractures of facial skeleton(combined)

➢ Maxillary fracture

➢ Naso-orbito-ethmoid fracture

➢ Zygomatic fracture

. Orbital apex fractures Juan Marcelo et al. Classification and epidemiology of orbital fractures diagnosed by computed tomography Rev. Argent. Radiol. 2013;77(2):139-145Rev. Argent. Radiol. 2013;77(2):139-145

FRACTURES LIMITED TO ORBITAL SKELETON

Blow Out Fracture

- Most common orbital injury
- Blunt objects (>5cm in size)
- Mainly involve floor and medial wall

CLASSIFICATION OF BLOW-OUT FRACTURE

1. **PURE BLOW-OUT FRACTURE**

Fracture of orbital bones associated with orbital rim intact

2. IMPURE BLOW-OUT FRACTURE

Fracture of orbital bones associated with fracture of Orbital rim May involve

- ➢ Orbital floor
- ➢ Medial wall
- ➢ Roof
- ➢ Lateral wall

EFFECTS ORBITAL FLOOR FRACTURE

- Herniation of orbital contents
- Entrapment of inferior rectus
- Damage to infraorbital nerve

CLINICAL FEATURES

- Diplopia (Defective Elevation)
- Infraorbital numbness
- Periocular ecchymosis & Oedema
- Enophthalmos / hypoglobus
- Orbital Emphysema

TRAP DOOR FRACTURE

- Children and young adults
- Defined by the lack of displacement of the involved bones
- Little ecchymosis or oedema (white eye)
- Marked extraocular motility restriction
- Oculocardiac reflex

INVESTIGATIONS

Plain X Rays

➢ Water's view

May miss 5 to 10% of orbital wall fractures

Computerised Tomography

➢ CT is the diagnostic method of choice

Coronals provide best view Rowe-Jones JM, Adam EJ, Moore-Gillon V. Subtle diagnostic markers of orbital floor blow-out fracture on coronal CT scan. J Laryngol Otol. Feb 1993;107(2):161-2. Tear drop sign Tra

TREATMENT

Initial management

– Use of nasal decongestants

– Broad spectrum antibiotics

– Oral steroids to prevent fibrosis

– No nose blowing

TREATMENT

Non-surgical Management

Wait and watch Indications

- ➢ No significant enophthalmos (2 mm or less)
- ➢ No marked hypoglobus
- ➢ No entrapped muscle or tissue
- ➢ Fracture less than 50% of the floor
- ➢ Lack of diplopia

The patient can be treated with oral antibiotics and a short course of oral steroid

SURGICAL MANAGEMENT

Three guidelines widely accepted for intervention are

- ➢ Diplopia with a positive forced duction test
- ➢ Enophthalmos exceeding 2mm that is cosmetically unacceptable
- ➢ Large fractures involving at least half of the orbital floor.

Clinical recommendations for repair of isolated orbital floor fractures

: An evidence-based analysis. Ophthalmology: Volume 109, Issue 7, Pages 1207-1210 (July 2002)

SURGICAL MANAGEMENT

Immediate Intervention

- Diplopia with CT evidence of an entrapped muscle or periorbital tissue with

  Non resolving oculocardiac reflex

Bradycardia White-eyed blow-out fracture Clinical recommendations for repair of isolated orbital floor fractures: An evidence-based analysis. Ophthalmology: Volume 109, Issue 7, Pages 1207-1210 (July 2002).

SURGICAL MANAGEMENT

Delayed Intervention

- **Patients with isolated blow-out fractures:**
  - ➢ Can be followed clinically
  - ➢ Surgery is planned for 7-14 days after the trauma
- **Waiting allows time for:**
  - ➢ Spontaneous improvement
  - ➢ Resolution of swelling associated with the initial trauma
  - ➢ Precise surgical planning
- **Delaying surgery for over 14 days results in increased scarring of orbit**

SURGICAL MANAGEMENT

Surgical Approaches

Transcutaneous

a. Subciliary

b. Subtarsal

c. Orbital rim Transconjunctival Transantral Caldwell-Luc procedure

IMPLANTS FOR ORBITAL FLOOR RECONSTRUCTION

Alloplastic Implant

- Porous polyethelene implant
- Titanium mesh
- Teflon,

Silicone

- Hydroxyapatite Autologous materials
- Calverium
- Iliac crest
- Ribs

Newer Implants

Composite implants

➢ Composite of porous`polyethylene and titanium mesh

➢ Hydroxy Apatite-reinforced high-density composite (HAPEX) Resorbable Implants

➢ Polydioxane(Ethysorb)

➢ Polyglycolic acid (PGA)

- Poly L – Lactic Acid (PLLA) ➢ Resorbable PLLA/PGA implant(lactosorb®) Francesco Baino et al.Biomaterials and implants for orbital floor repair.Acta Biomaterialia, Vol. 7, pp. 3248-3266, 2011 (ISSN 1742-7061)

ORBITAL HAEMORRHAGE

Localized to the

➢ Subperiosteal space,

➢ Extraconal/intraconally within the orbital soft tissue

➢ Within the belly of extraocular muscles

Clinical features

➢ Pain, diplopia or decreased vision.

➢ Ecchymosis ,oedema

➢ Elevated intraocular pressure, choroidal folds

➢ Compressive retinal vascular compromise, or optic neuropathy

➢ Globe luxation

MANAGEMENT

- **MEDICAL TREATMENT**

- Oxygen therapy,
- Intravenous mannitol,
- Intravenous acetazolamide,
- Steroids and topical β-blockers

SURGICAL TREATMENT

- In presence of nerve compression ,
- Altered arterial perfusion,
- Hematic cyst

AN EMERGENCY

- Lateral canthotomy and cantholysis
- Imaging like CT to be done if further decompression is needed
- An inferolateral anterior orbitotomy may be required to drain hemorrhage.

INTRAORBITAL FOREIGN BODIES

They can be classified according to their composition into

- ➢ Metallic such as steel
- ➢ Nonmetallic, which may be inorganic such as glass
- ➢ Organic such as wood or vegetable matter.

MANAGEMENT

Investigations

➢ Plain film x-ray

➢ CT scan

➢ MRI (not in ferromagnetics)

Treatment Medical

➢ Tetanus prophylaxis

➢ Culturing the wound /the foreign body if removed

➢ Antibiotics

Surgical removal

➢ Organic matter like wood and vegetable matters

➢ Easily accessible in the anterior orbit

➢ Foreign body-related complications (optic nerve compression, infections, and extraocular muscle involvement

ORBITAL EMPHYSEMA

- An abnormal condition in which air is accumulated within the eyelids, orbit or both.
- Following orbital trauma, fractures of paranasal sinuses & orbital walls

Other causes

- Sneezing, nose blowing,
- Pressure changes during air travel

Spontaneous Lee SL, Mills DM, Meyer DR, Silver SM. Orbital Emphysema.Ophthalmology 2006; 113:2113.e1–e2.

SIGNS & SYMPTOMS

- Periorbital swelling
- Proptosis / Dystopia
- Loss of vision
- Occlusion of the central retinal artery
- Compressive optic neuropathy

MANAGEMENT

No nose blowing, sneezing, diving and flying and to refrain from performing valsalva maneuver for 7–10 days

Most cases resolve spontaneously in 2 to 3 weeks with conservative treatment.

Indication for orbital decompression

- ➢ Restricted ocular motility
- ➢ Sluggish pupillary reaction
- ➢ Disc odema or decreased visual acuity Surgical approach
- ➢ Lateral canthotomy /cantholysis and orbital decompression

Under water needle aspiration by using 24 gauge needle Lee SL, Mills DM, Meyer DR, Silver SM. Orbital Emphysema.Ophthalmology 2006; 113:2113.e1–e2.

GLOBE LUXATION

Globe luxation occurs when the globe is displaced anteriorly beyond the orbital rim

- Usually post traumatic, also spontaneous or voluntary

Clinical features

➢ Severe anxiety, pain

➢ Extreme proptosis

➢ Corneal exposure

➢ Retinal venous congestion

➢ Optic neuropathy

MANAGEMENT

- ➢ Immediate reduction of the globe is paramount
- ➢ Emergency lateral canthotomy and cantholysis
- ➢ If further decompression is needed, an inferolateral anterior orbitotomy may be required to break the fibrous septa of the orbital fat compartments and to drain haemorrhage
- ➢ Temporary tarsorrhaphy

Leiv M. Talke et alGlobe Subluxation: Review and Management.Review of ophthalmology. 7/17/2007

- Thanks

Posterior Segment Trauma

(Do’s and Don’t)

Dr.Abhishek

Associate Professor

AIIMS Kalyani

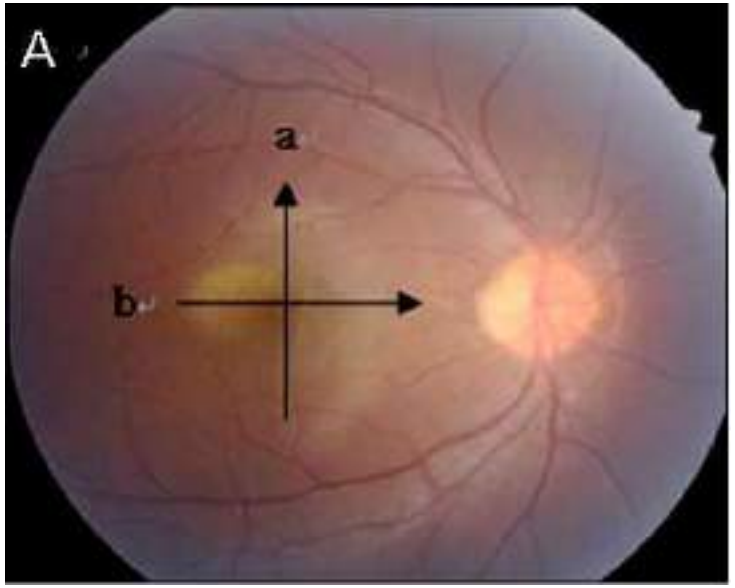
- Coup
  (Sclopetaria)

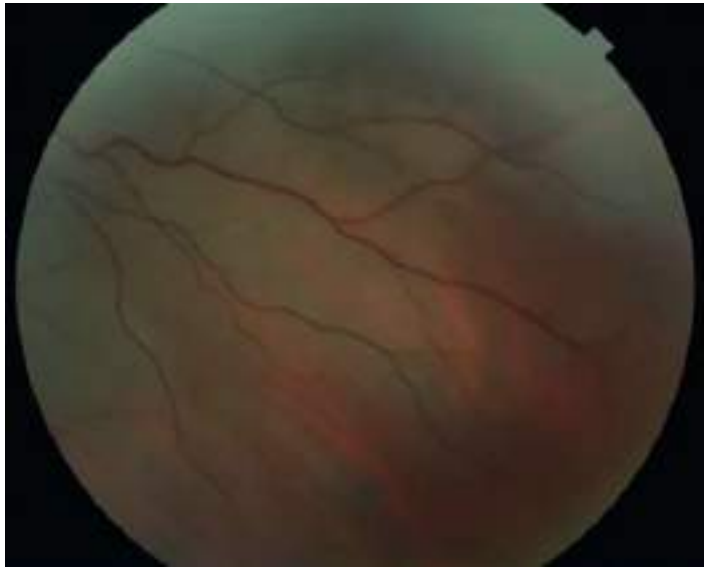
- Counter coup
  (commotio retinae, choroidal rupture & traumatic macular hole)

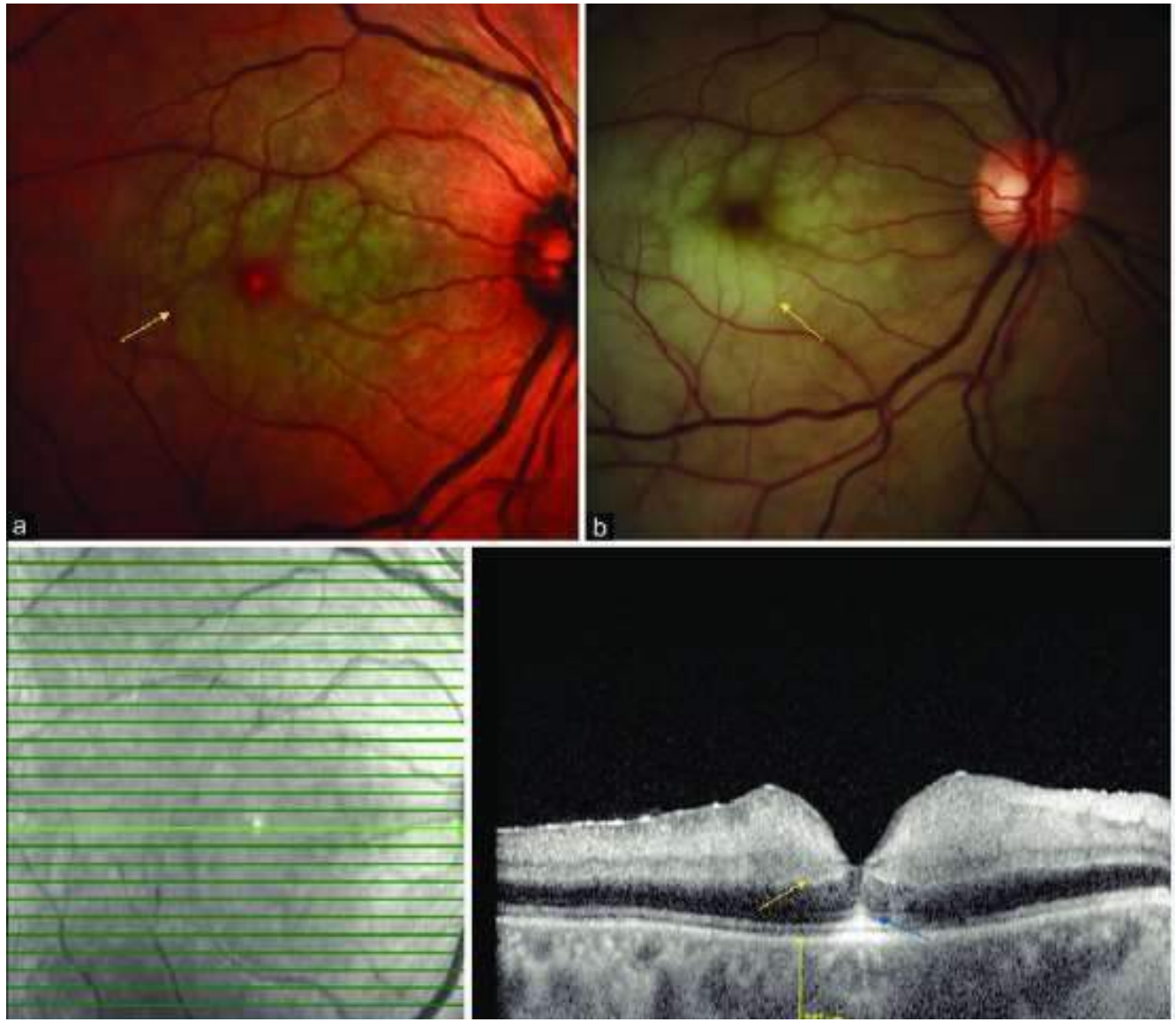
- Antero Posterior compression
  (vitreous base avulsion & retinal dialysis)

Commotio Retinae

- Intraretinal opacification
- Extracellular oedema
- Intracellular oedema
- Photoreceptor outer segment disruption
- No leakage on FFA
- Self resolving
- Vision loss



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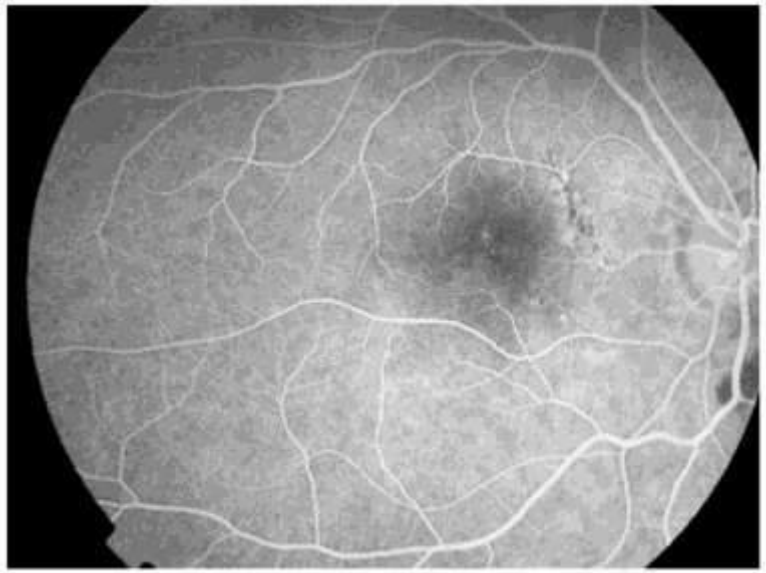
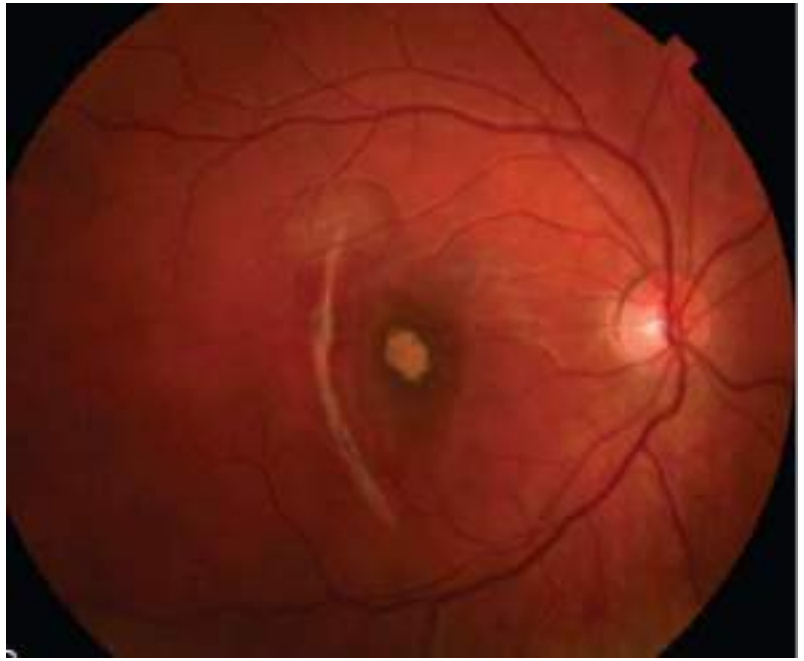


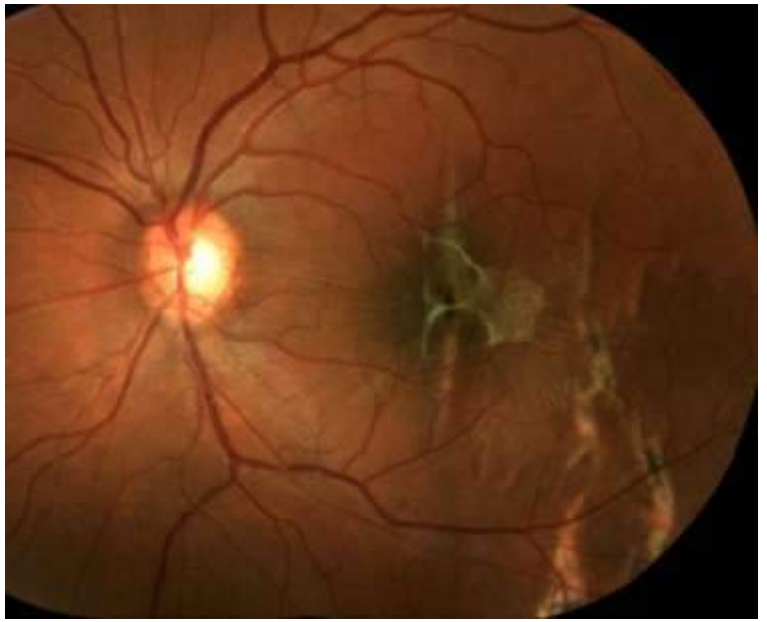
- Do’s
- Observation
- Counselling

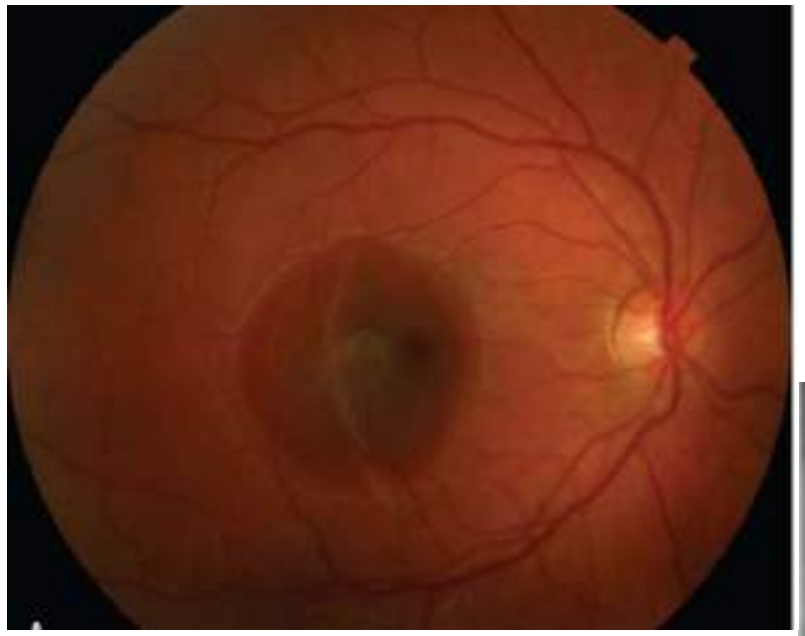
- Don’t
- FFA
- AntiVEGF

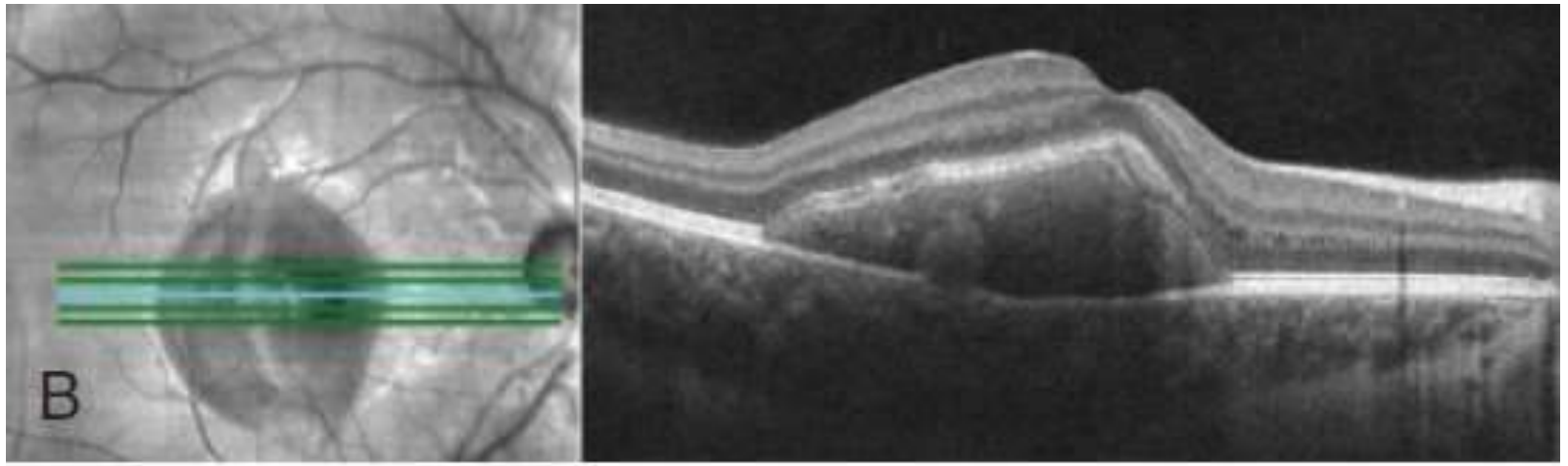
Choroidal Rupture

- Focal
- Single, multiple
- Foveal, extra foveal, peripheral
- Temporal to the disc
- Concentric pattern
- Tears of choroid, Bruch’s membrane, RPE
- CNV





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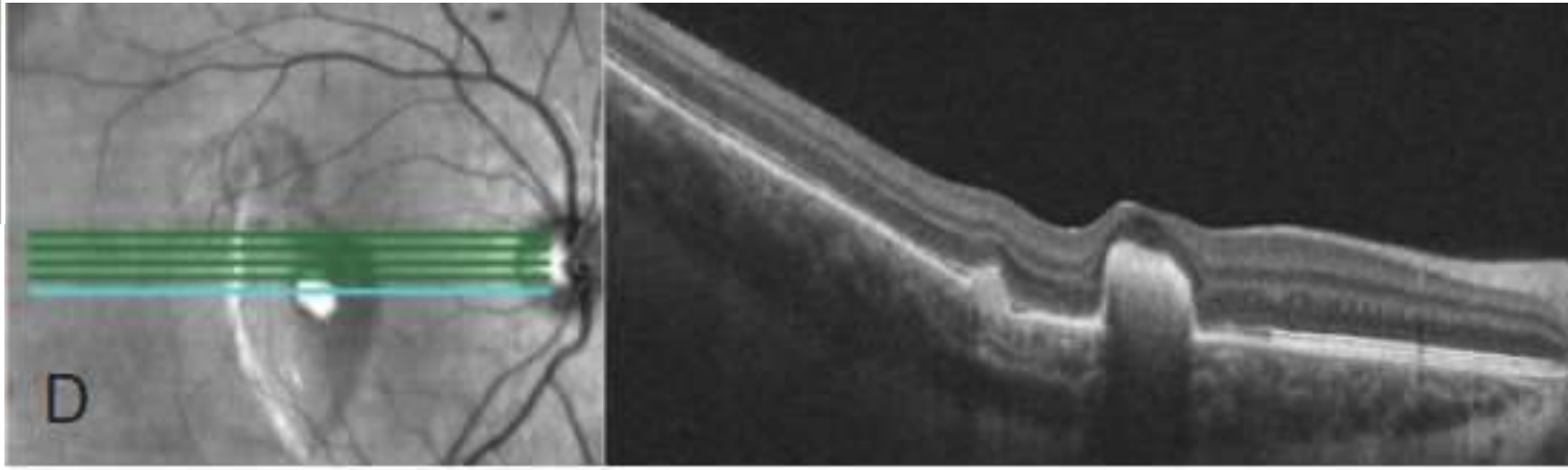
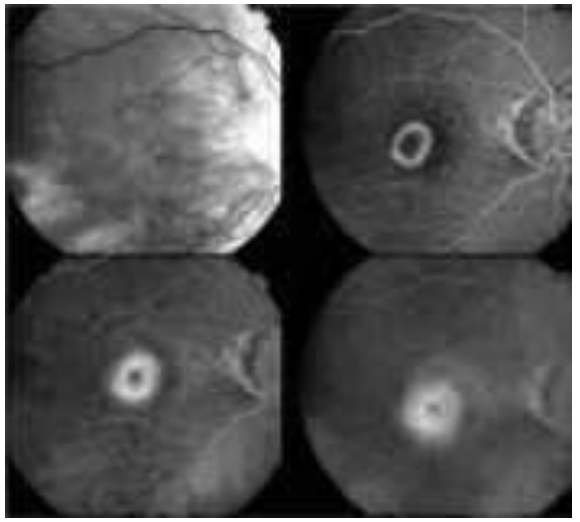
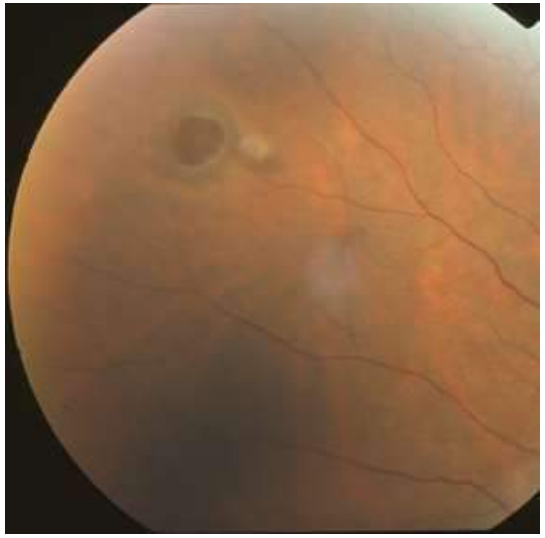

D

- Do’s
- Close follow up
- Metamorphopsia
- Periphery
- FFA
- Anti VEGF

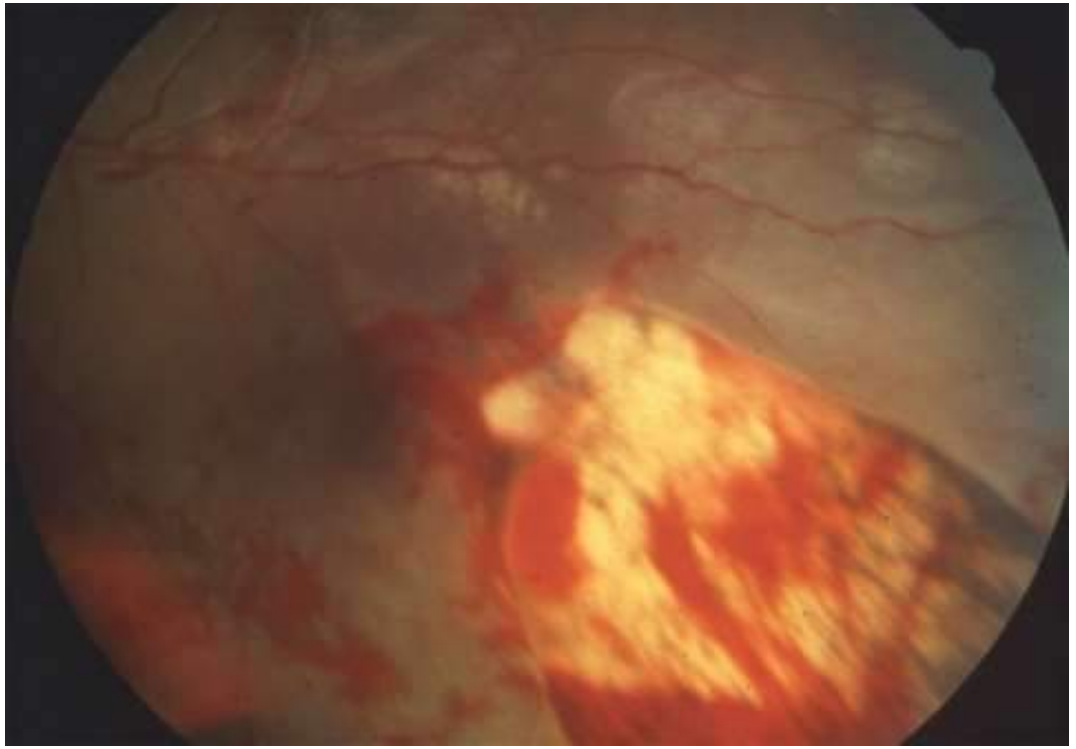
- Don’t
- Lost follow up



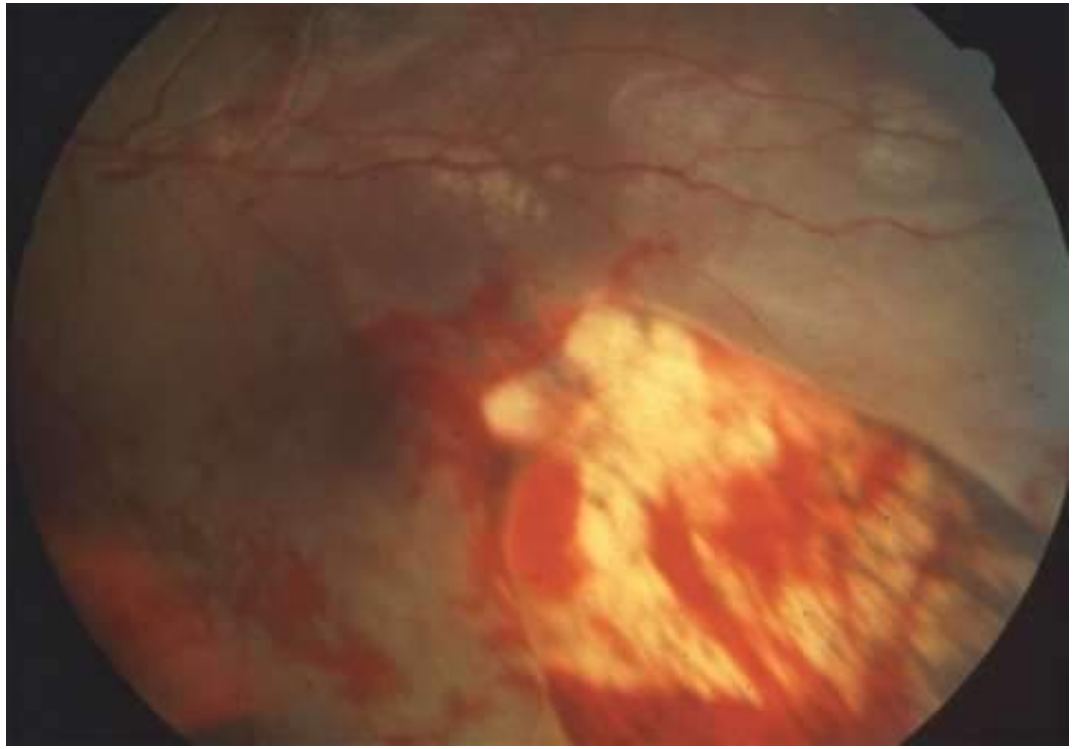


Traumatic Chorioretinal Rupture

- Sclopetaria
- High-velocity projectile
- Tangential to globe
- Short gun, missile
- Rupture-retina, choroid
- Retraction

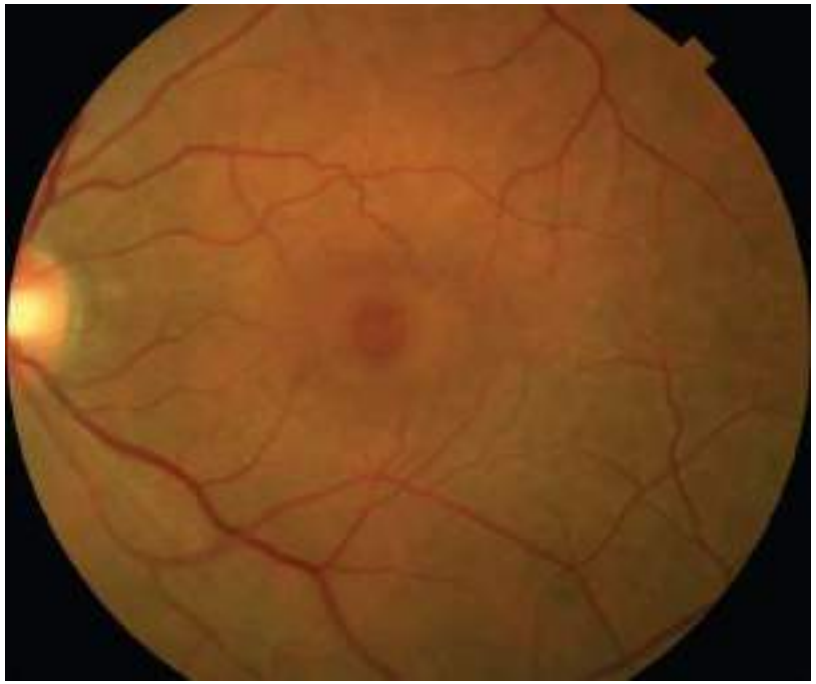


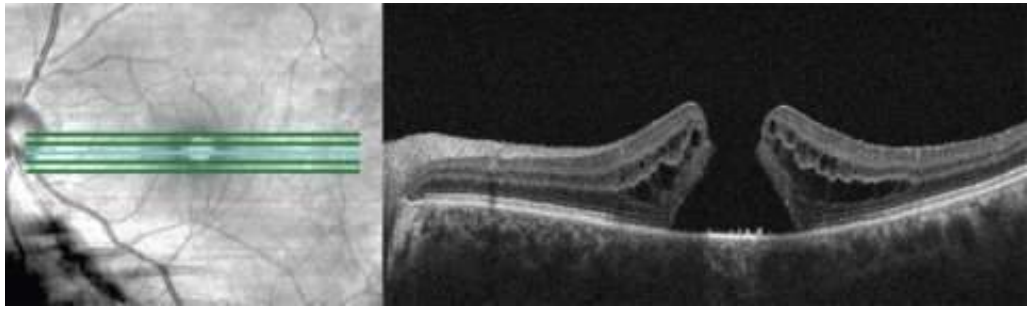
- Do’s
- Careful follow up
- Retinal breaks, RD, VH
- Vitrectomy
- Don’t
- Prophylactic laser



Traumatic Macular Hole

- 6/12- HMCF
- Full-thickness
- Surrounding cuff of SRF
- Intraretinal cystic changes
- 500-1500mm

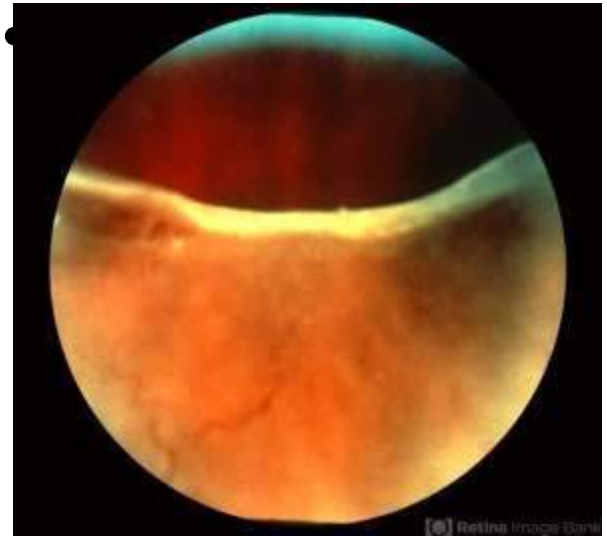




- Do’s
- Surgery
- GVP
- Periphery

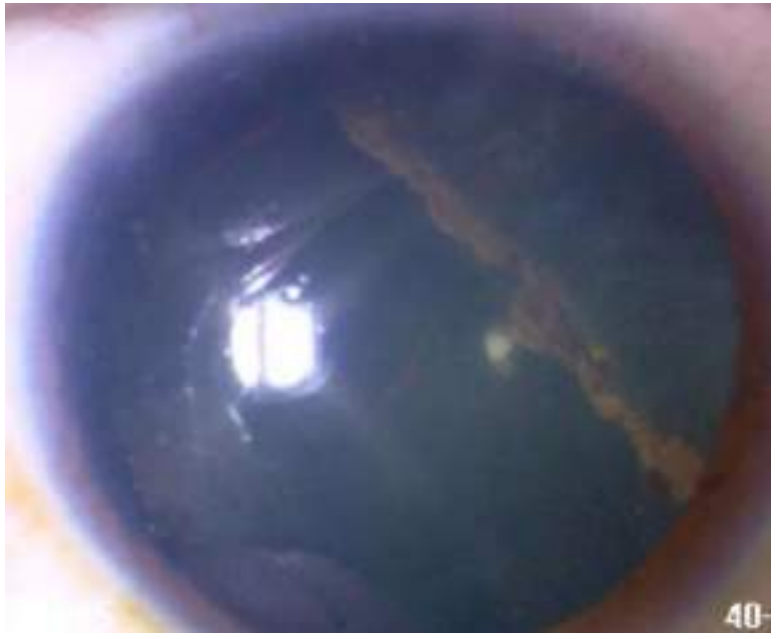
- Don’t
- Overpromise
- Prophylactic laser

Retinal Detachment

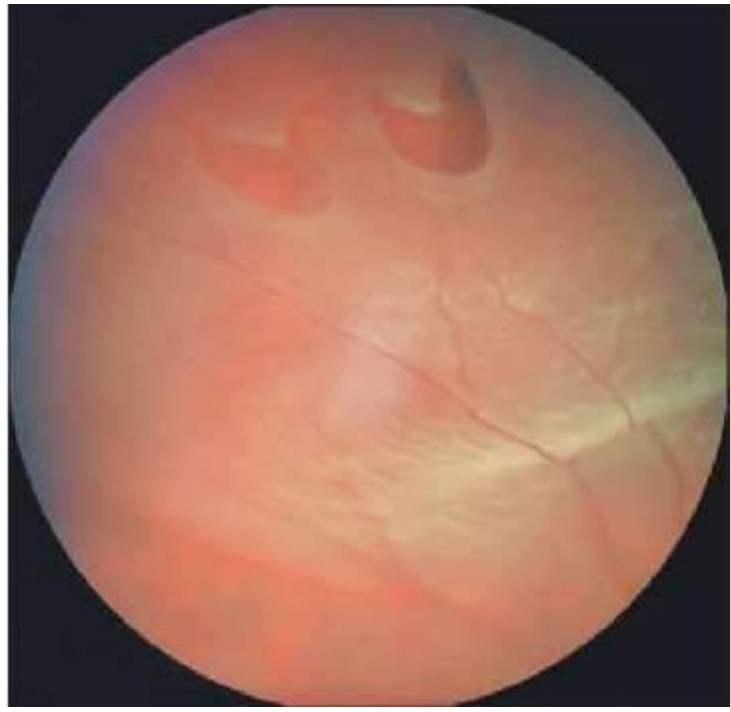


Retinal dialysis

GRT



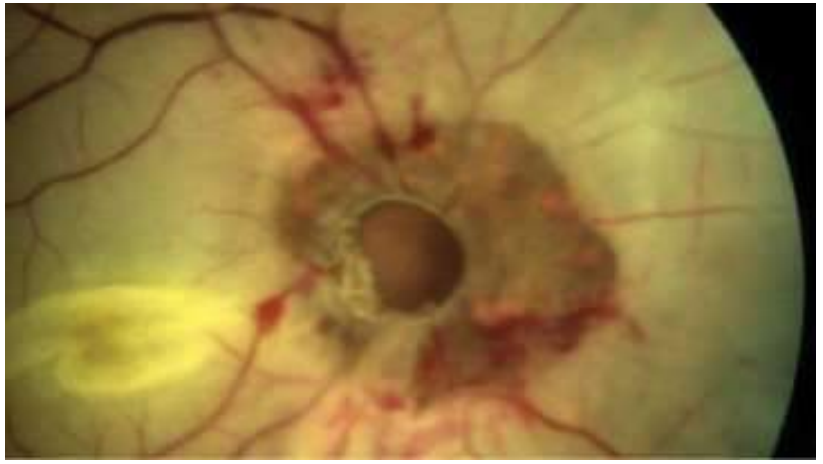
Vitreous base avulsion

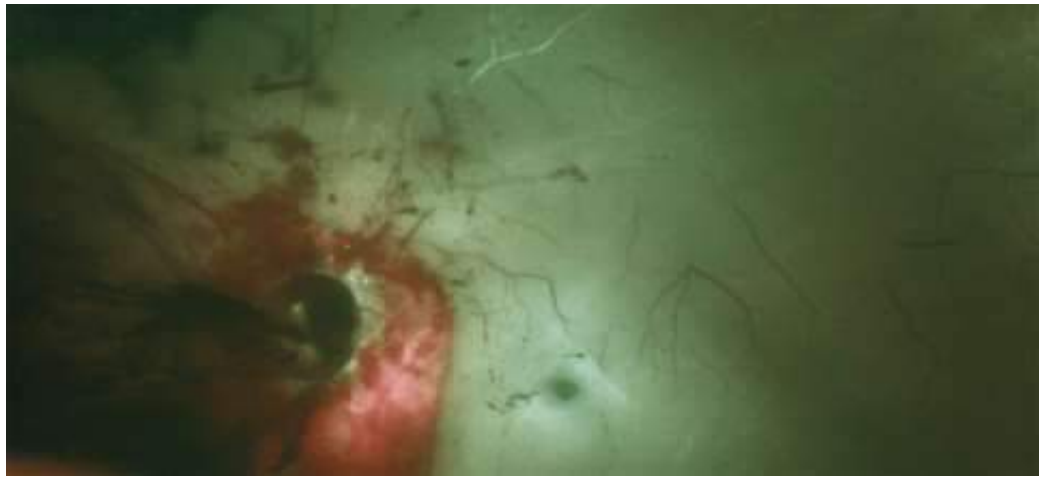


HST

Optic Nerve Avulsion

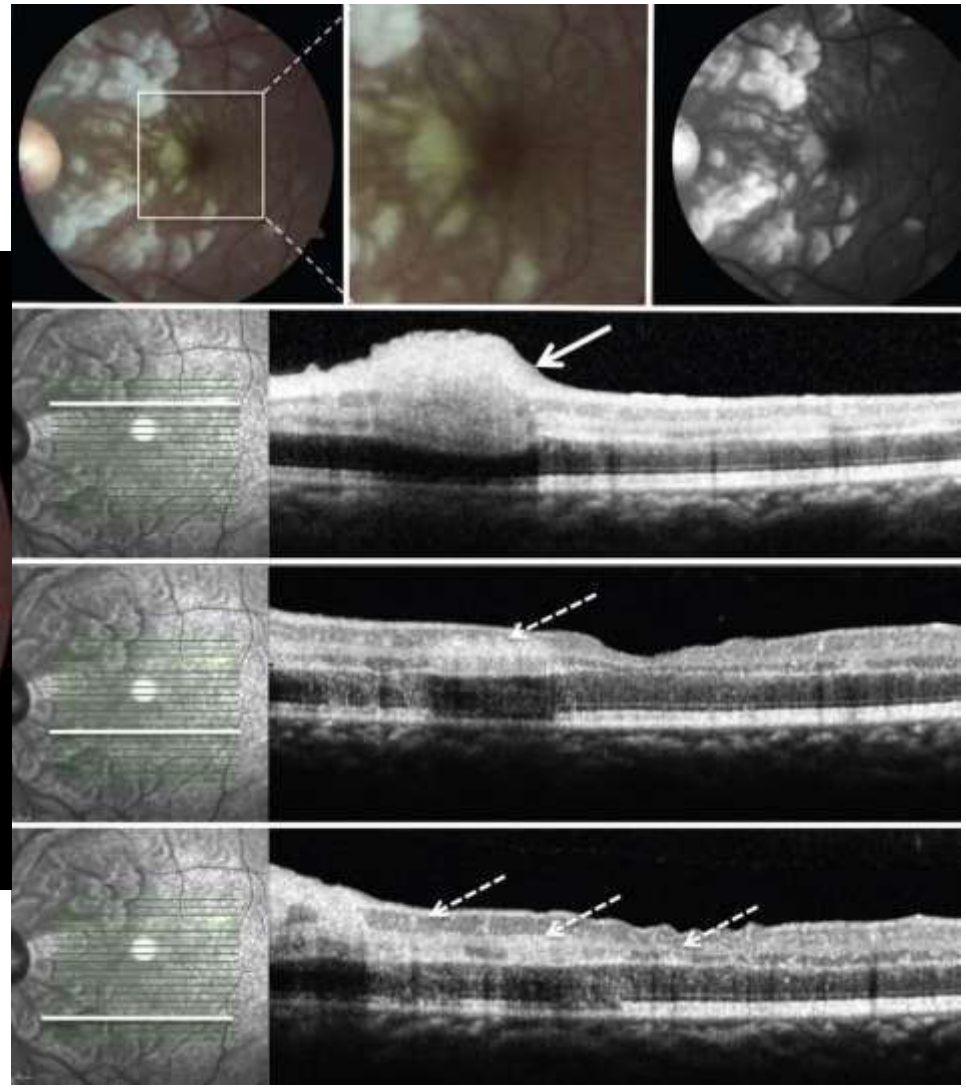
- Severe blunt force
- No PL
- Separation of retina from optic nerve
- Excavation of the optic nerve
- Extensive haemmorhages
- CRAO





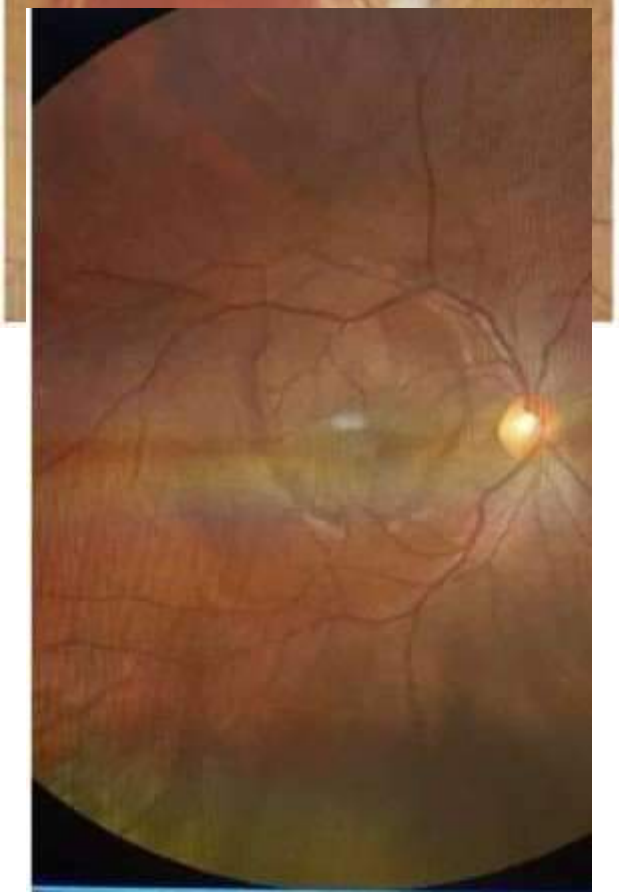
Purtscher retinopathy

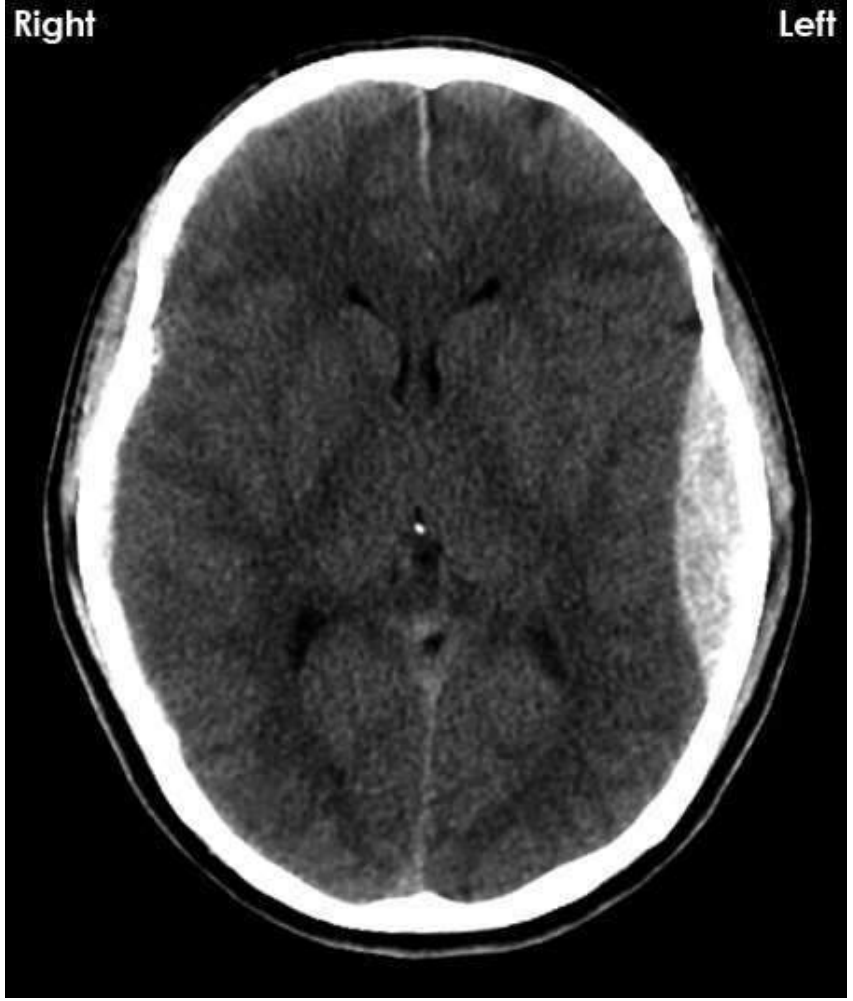
- Severe head trauma
- Pancreatitis
- Long bone fracture
- Chest compression injuries
- Air & amniotic fluid embolization
- Vn: 20/20 to CF
- Cotton wool spots
- Retinal whitening



Terson syndrome

- Intraocular haemorrhage
- Subarachnoid/Subdural haemorrhage
- Aneurysm, Trauma
- VH, Preretinal haemm, Subhyaloid haemm
- ↑ICP— ↑Venous pressure
- Gradual resolution
- Surgical intervention

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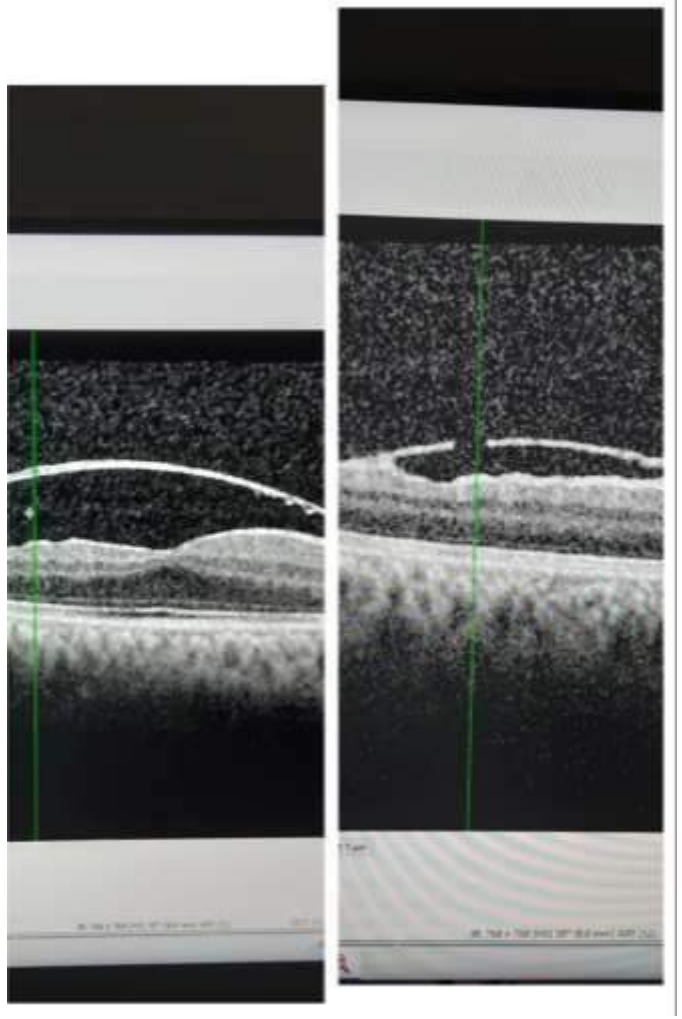
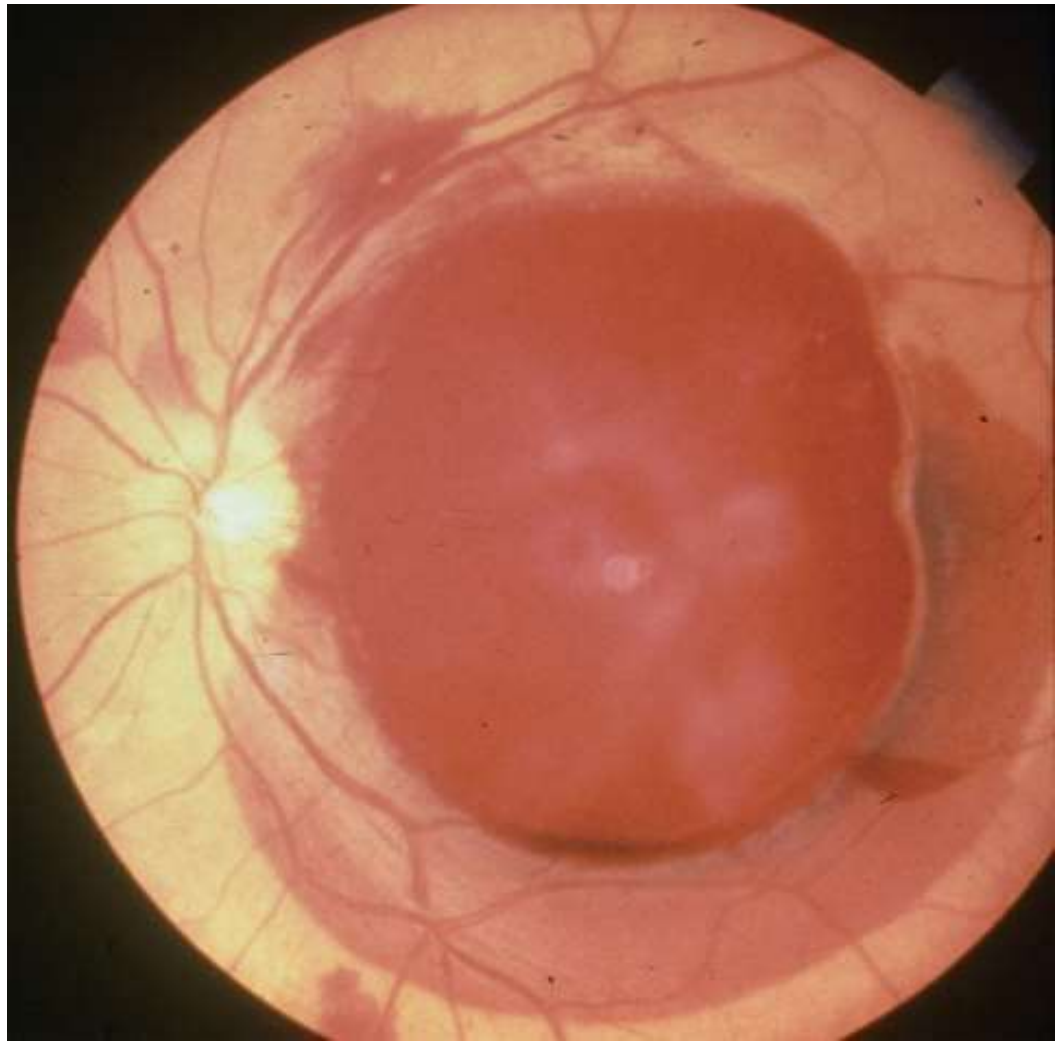
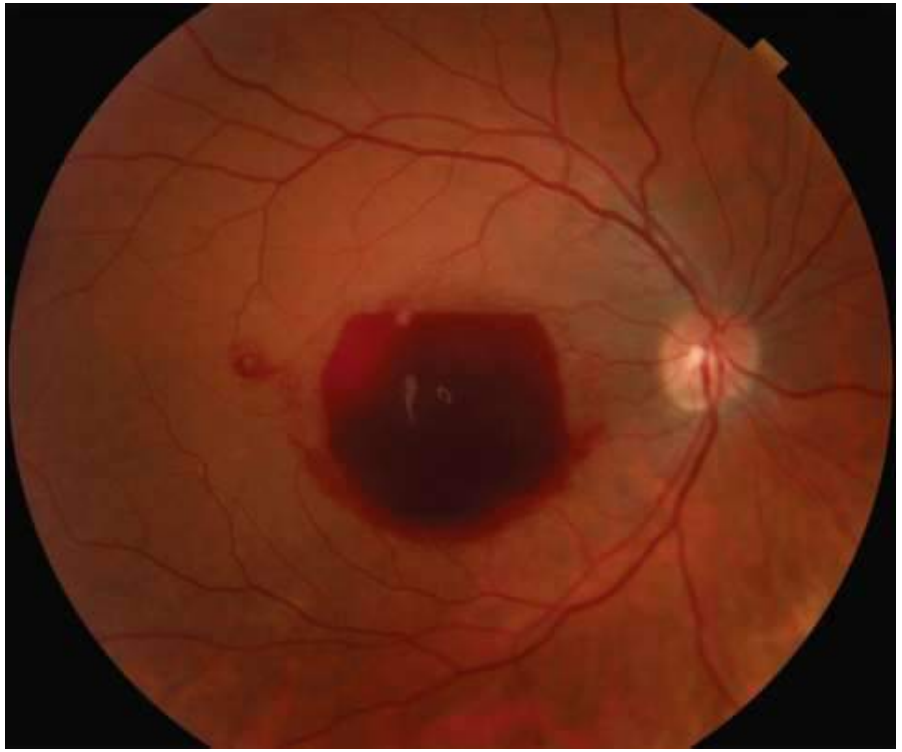
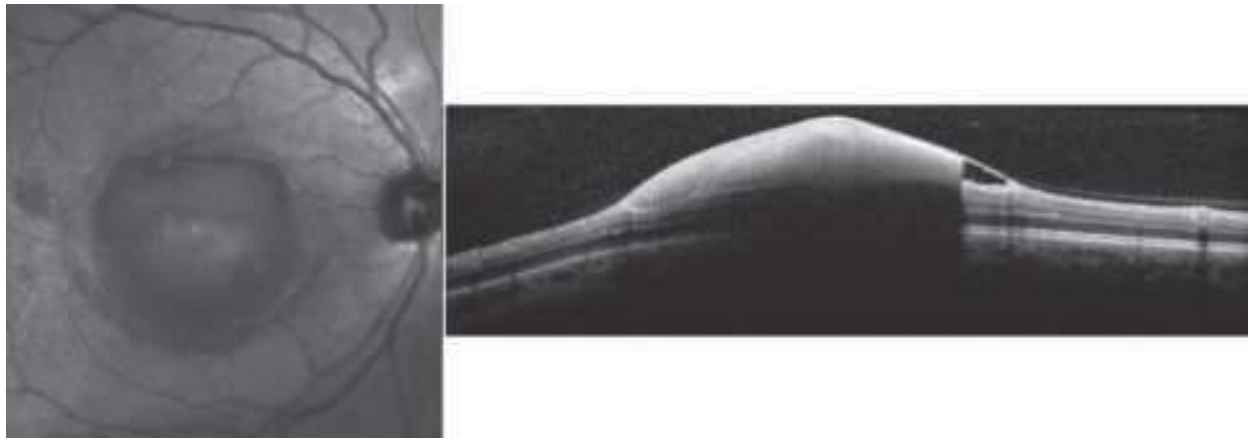


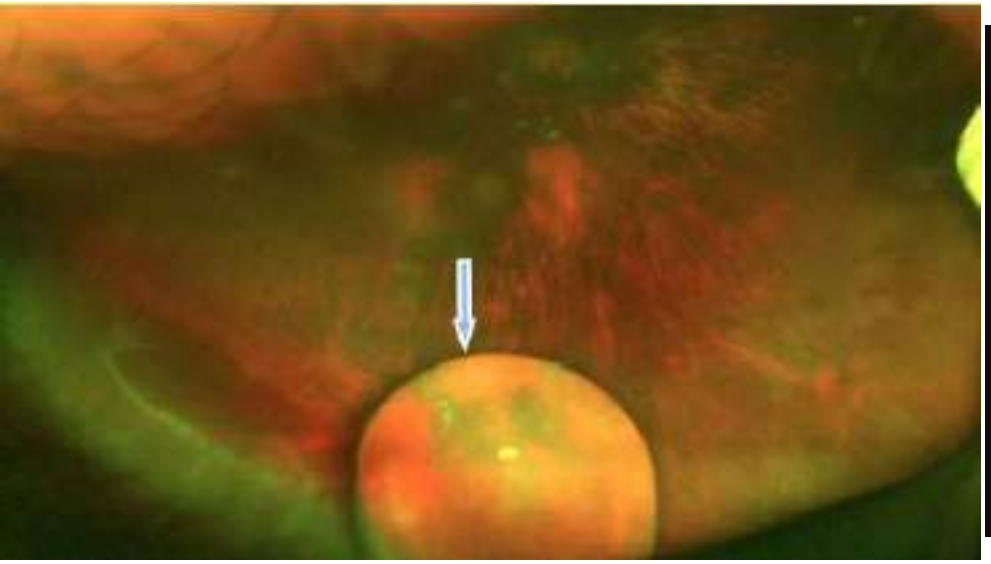


Valsalva Retinopathy

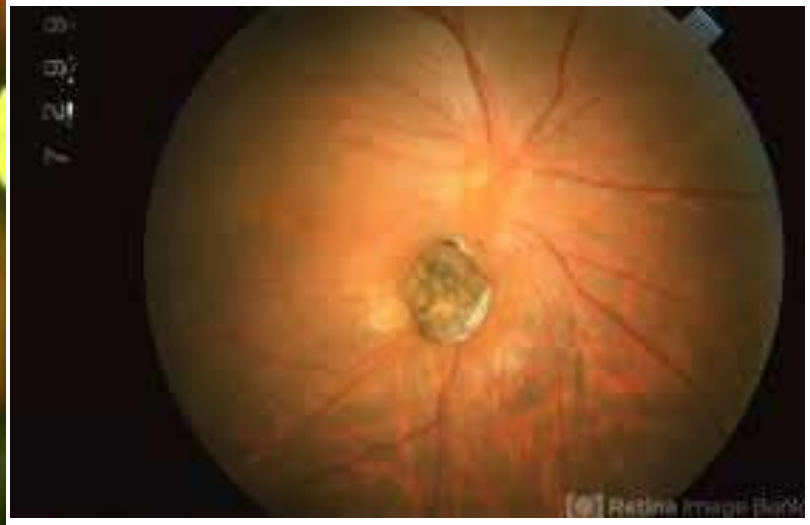
- Heavy lifting, coughing, vomiting
- Straining during bowel movement
- Intra- thoracic or intra-abdominal pressure
- Closed glottis
- Rupture of superficial retinal capillaries
- Sub ILM haemmorhage



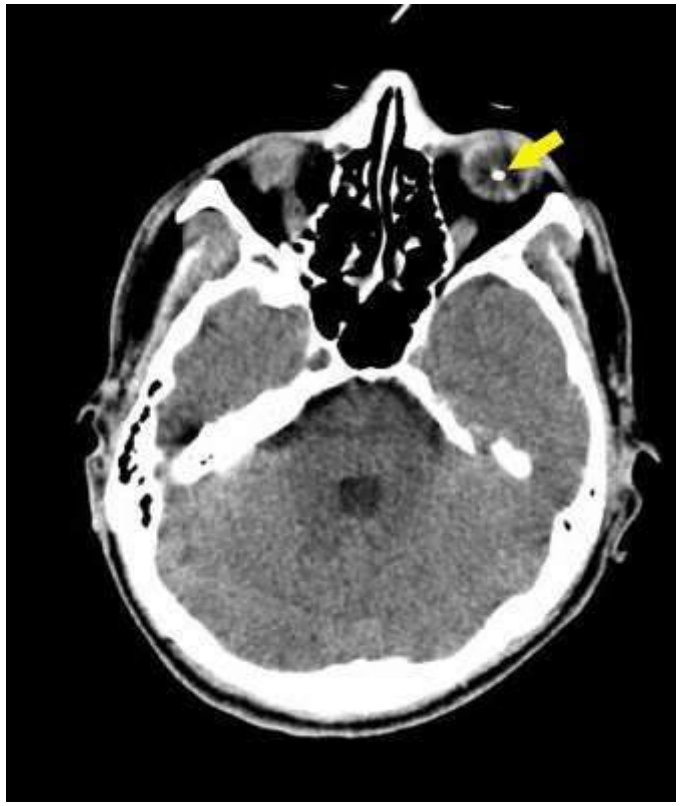




Dislocated lens



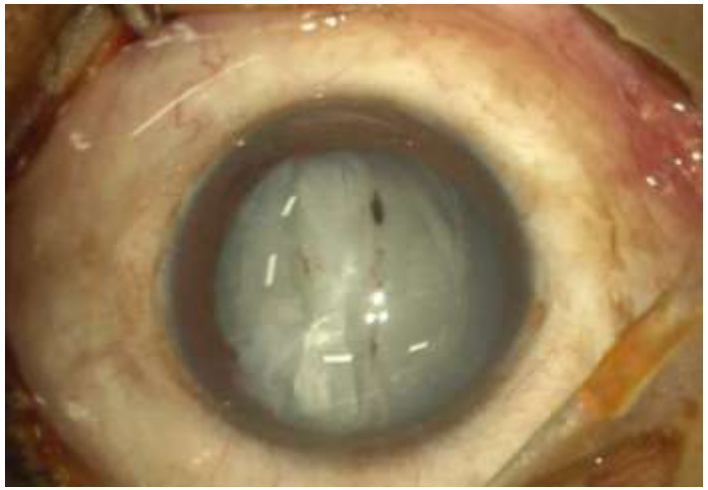
Intraocular foreign body



Thank You

Management of Traumatic Cataract

IC 132: Do's and Don't



Dr Amit Raj
Professor and HOD
Department of Ophthalmology
AIIMS Patna

Epidemiology

- Lifetime prevalence of ocular trauma 14%
- 27-65% of ocular trauma lead to cataracts
- Young children and adults
- Male preponderance
- Causative factor: Penetrating> Blunt trauma
- Farming, Industrial work

1. *Katz J, Tielsch JM. Lifetime prevalence of ocular injuries from the Baltimore Eye Survey. Arch Ophthalmol 1993*
2. *Sharma AK, Aslami AN, Srivastava JP, Iqbal J. Visual outcome of traumatic cataract at a tertiary eye care centre in North India: a prospective study. J Clin Diagn Res 2016*
3. *Siddharam S. Janti, A. M. Raja, C. Charanya, Adnan Matheen. "A Prospective Study of Traumatic Cataract and its Visual Outcome". Journal of Evolution of Medical and Dental Sciences 2014*

Risk Factors

- Lack of protective gear
- Male gender
- Rural residence
- Lower socio-economic status

1. *Sharma AK, Aslami AN, Srivastava JP, Iqbal J. Visual outcome of traumatic cataract at a tertiary eye care centre in North India: a prospective study. J Clin Diagn Res 2016*
2. *Siddharam S. Janti, A. M. Raja, C. Charanya, Adnan Matheen. "A Prospective Study of Traumatic Cataract and its Visual Outcome". Journal of Evolution of Medical and Dental Sciences 2014*

Pathophysiology

- May form immediately or months-years later

Equatorial expansion

Coup and counter coup injury

↓

Damage to lens fibers

↓

Cataract formation

Rupture of ALC with seepage of aqueous into lens fibers

↓

Immediate cataract formation

1. *Inanc M, Tekin K, Erol YO, Sargon MF, Koc M, Budakoglu O, Yılmazbas P. The ultrastructural alterations in the lens capsule and epithelium in eyes with traumatic white cataract. Int Ophthalmol. 2019*
2. *Sharma AK, Aslami AN, Srivastava JP, Iqbal J. Visual outcome of traumatic cataract at a tertiary eye care centre in North India: a prospective study. J Clin Diagn Res 2016*

Evaluation

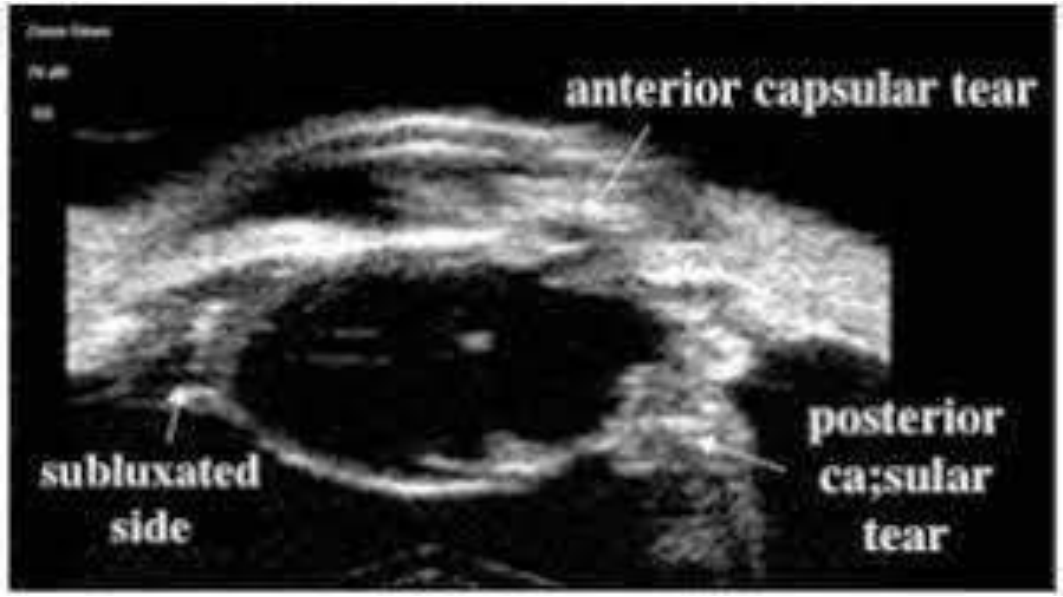
- History
  - ❖ Mechanism of injury
  - ❖ Timeline of injury
  - ❖ Ocular history
  - ❖ Systemic comorbidities

Examination

- Visual Acuity
- Pupillary Reflex
- Intra-ocular pressure
- Signs of capsular and/or zonular damage
- Dilated fundus examination: must
- Rule out associated ocular/orbital injury

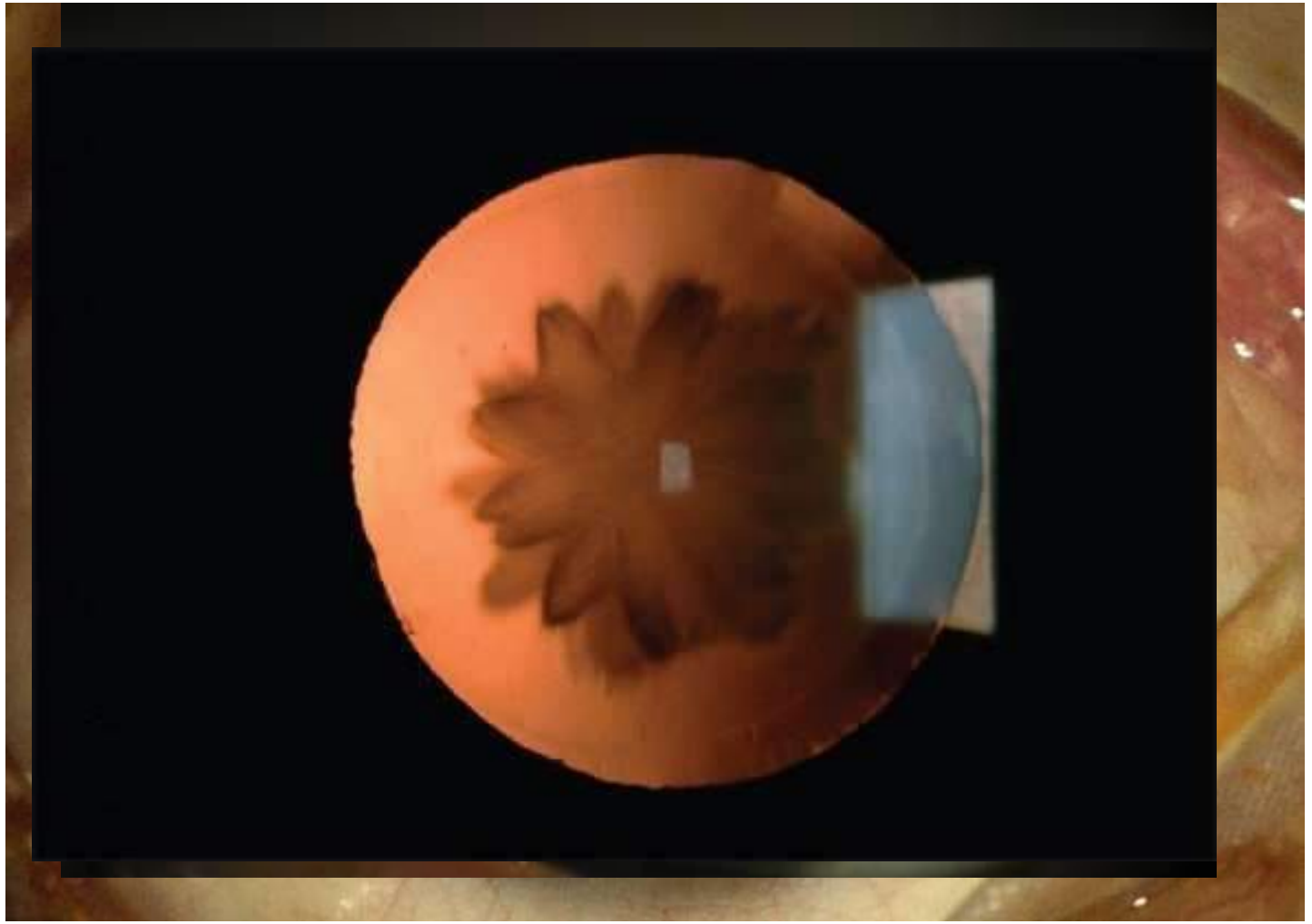
Role of Investigative Modalities

- B scan
  - ✓Diagnostic as well as prognostic value
- UBM
- OCT
- CT scan
- Electrophysiological tests



Morphology and Choice of Surgery

- Different morphologies
  - Membranous
  - Rosette
  - Soft-white
  - Total



Primary vs Secondary Cataract Extraction

Primary

- Early visual rehabilitation
- Low risk of elevated IOP
- Reduced risk of developing amblyopia
- Less chances of synechiae
- Reduced time and cost of hospitalisation

Secondary

- Quiet eye
- Less inflammation
- Better visualisation
- Better IOL calculation

1. *Memon MN, Narsani AK, Nizamani NB. Visual outcome of unilateral traumatic cataract. J Coll Physicians Surg Pak 2012*
2. *Agarwal A, Kumar DA, Nair V. Cataract surgery in the setting of trauma. Curr Opin Ophthalmol 2010*
3. *Kuhn F. Traumatic cataract: what, when, how. Graefes Arch Clin Exp Ophthalmol 2010*

Pre-requisites During Surgery

- Phaco machine with anterior vitrectomy
- Iris hooks/ Pupillary expansion devices
- Back up 3-piece/PMMA IOL
- Capsular Tension Rings (CTR)
- Co-axial micro-forceps and scissors
- High quality viscoelastics
- Vitreo-retinal support

Intraoperative Considerations

- Phaco parameters on lower side
- Low Bottle height
- Staining of anterior capsule
- Avoid hydrodissection

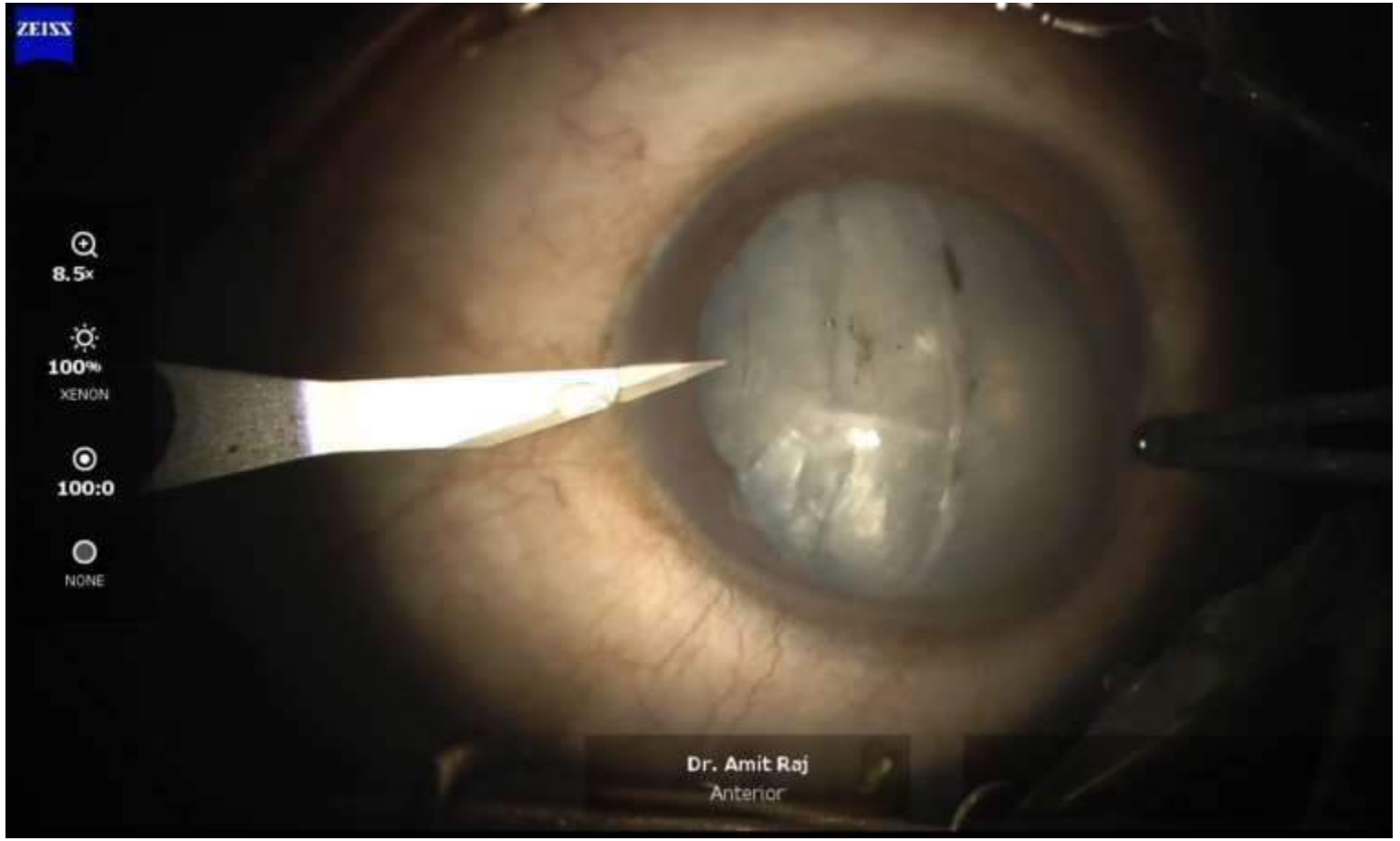
Case 1

- 22 yr old
- Male
- H/o blunt trauma 1 month back
- 3 clock hours(10-1) of lens subluxation


ZEISS
7.5×
100%
XENON
100:0
NONE
Dr. Amit Raj
Anterior

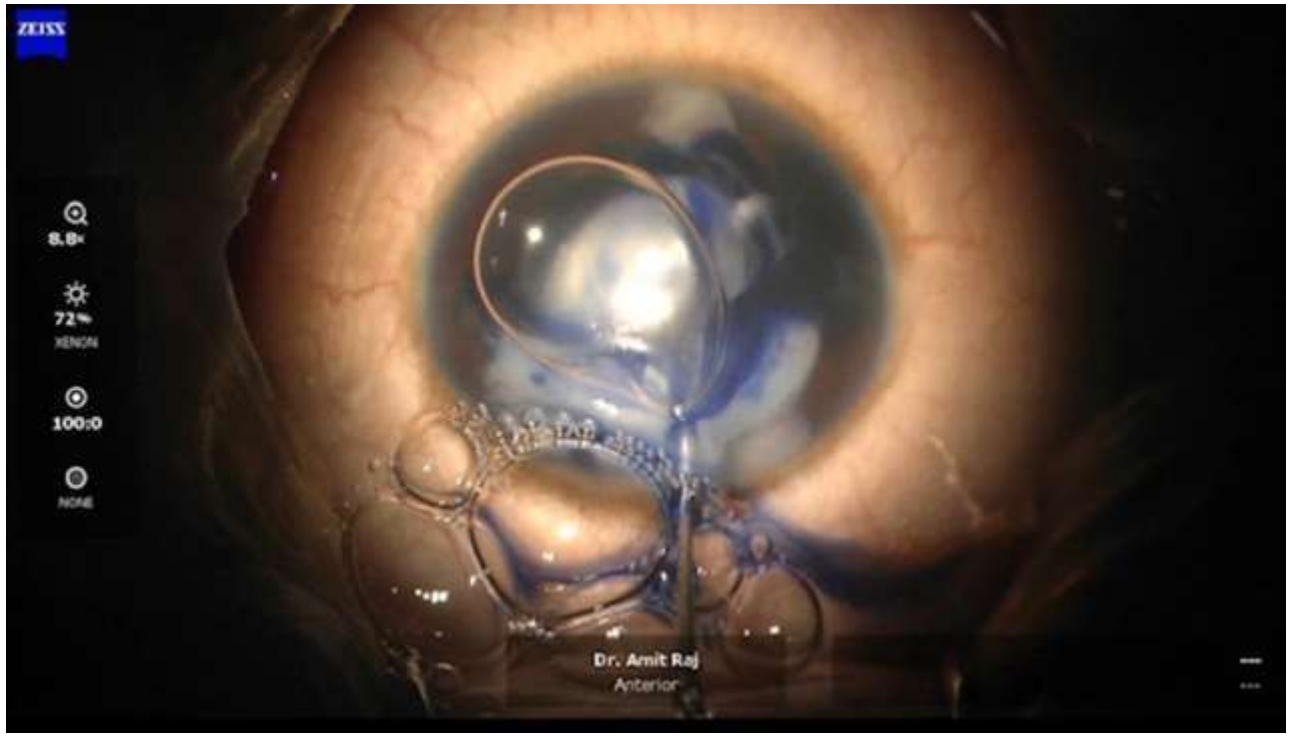
Case 2

- 45 yr old male
- H/o blunt trauma
- Argentinian sign type rupture of anterior capsule with total cataract
- 3 clock hours (4-7) of lens subluxation (detected intraop)


ZEISS
8.5x
100%
XENON
100:0
NONE
Dr. Amit Raj
Anterior

Case 3

- 7 yr old male
- H/o blunt trauma 1 month back
- Floating lens matter in anterior chamber
- Oval anterior capsular defect from 2-7 o’clock with thickening of capsular margin


ZEISS
8.8×
72%
XENON
100:0
NONE
Dr. Amit Raj
Anterior

Take home message!
Do's

- Thorough history: Mode/Time
- Rule out associated ocular and orbital trauma
- Control of inflammation and IOP
- Must incorporate preoperative radiological investigations
- Pre-requisites should be available before surgery
- Intraoperative phaco-parameter adjustment
- VR support/referral

Take home message!
Donts

- Retained introcular/intraorbital foreign body
- Miss associated zonular dialysis/PC rupture
- Hydrodissection
- High expectations for visual prognosis

Thank you

Management of traumatic gluacoma

Dr Subhash Prasad

Divyadrishti Eye Centre,Patna

IC 132 –AIOC Jaipur
Do's and Don't in Ocular Trauma : How to maximize Outcome?

No financial interest

Introduction

- Traumatic glaucoma is a type of **secondary glaucoma** that develops following **blunt or penetrating ocular trauma.**

- This subtype of glaucoma usually entails **several mechanisms** that interplay to produce increased intraocular pressure (IOP)

Types of Ocular injury

- Blunt
- Open Globe with or without Foreign body

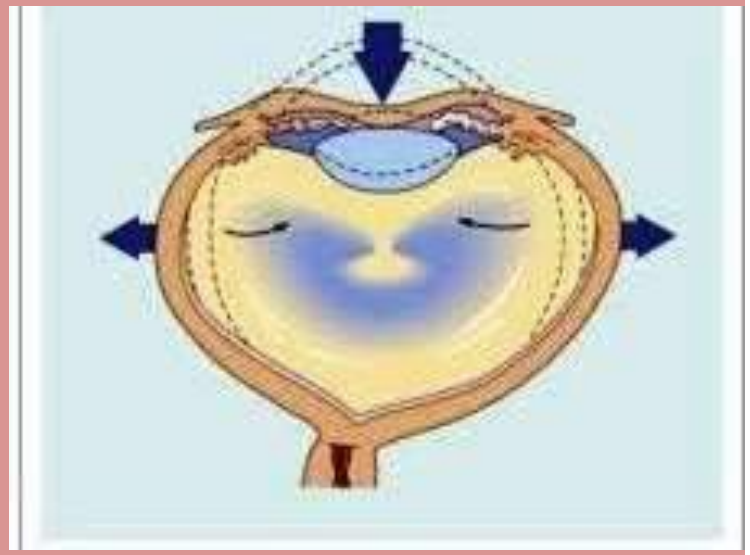
- Radiation
- Chemical injury
- Thermal

- Early onset or late onset

Tr. glaucoma sec to blunt injury

7 rings of tissues affected by blunt injury

- Sphincteric pupillae
- Iris base-Iridodialysis
- Ant.ciliary body trauma-**Angle recession-most common findings after contusion**
- Separation of ciliary body musle fibre from scleral spur- **cyclodialysis cleft**
- TBM-trabecular damage
- Zonules
- Retinal attachment at Ora serrata



Glaucoma following Blunt Injury

Early Onset

- Trabecular disruption
- Hyphema
- Iritis
- Choroidal hemorrhage

Late Onset

- Angle recession
- Ghost Cell Glaucoma
- Hemolytic
- Hemosiderotic
- Lens Subluxation/dislocation

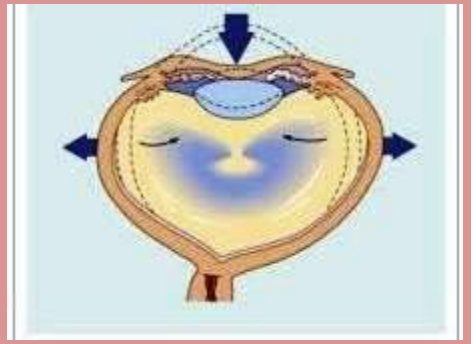
1)Trabecular meshwork disruption

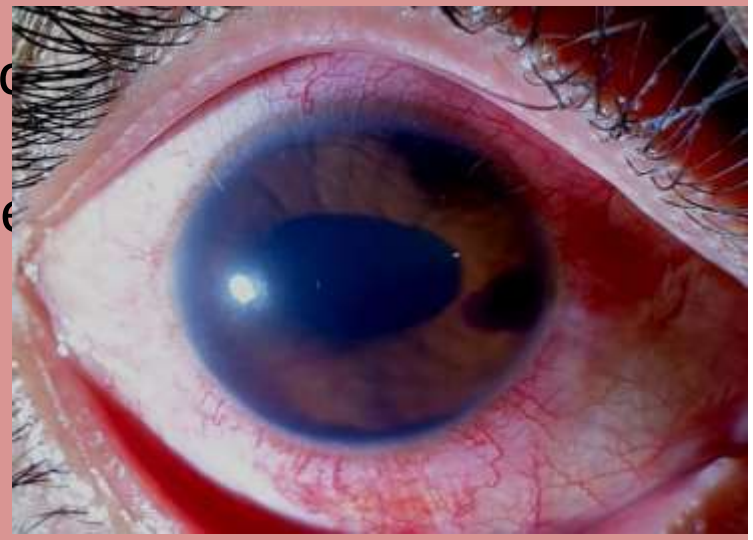
Gonioscopy-

- Superficial tear seen as trabecular flaps that are hinged at the level of the scleral spur.
- Full thickness tears- torn iris processes or blood in the angle or in Schlemm's canal
- Immediate and prolonged increase in IOP and may eventually resolve over time.
- Scarring from ciliary muscle disruption and angle injury along with TBM tears -late onset rise in IOP

2.**Hyphema**

- Source of bleeding-two main mechanisms
- First- anteroposterior compression of the globe with simultaneous equatorial expansion-tearing of the blood vessels of the CB and stromal iris.
- Sudden rise of IOP- damage of the fragile blood vessels of the iris/CB
- Obstruction of outflow channels by RBC,fibrin,platelets,pigments,lens partic or inflammatory debris
- Pt with sickle cell anemia-significant rise IOP





3)Traumatic Iritis

- Inflammation of the iris → compromise of the blood aqueous barrier and leakage of proteins and white blood cells → increase resistance at TBM → leading to a rise in IOP.
- Trabeculitis- leading to decrease in aqueous outflow

4)Choroidal hemorrhage:

- Acute increase in IOP following severe eye trauma or in patients who are on anticoagulation
- Mass effect in the posterior segment → forward displacement of the lens-iris diaphragm by the choroidal hemorrhage → angle closure glaucoma

Late onset Glaucoma pathophysiology

- **1)Angle-Recession (AR):**
- Tear bet.longitudinal and circular layers of the ciliary muscles ⟹ widened ciliary body band
- AR per se does not cauase rise in IOP
- AR signifies a more prominent damage in the trabecular meshwork ⟹ scarring and decrease in outflow facility
- 270 degree-risk of glaucoma-5%
- 360 degree-risk 24%

2)Ghost cell Glaucoma

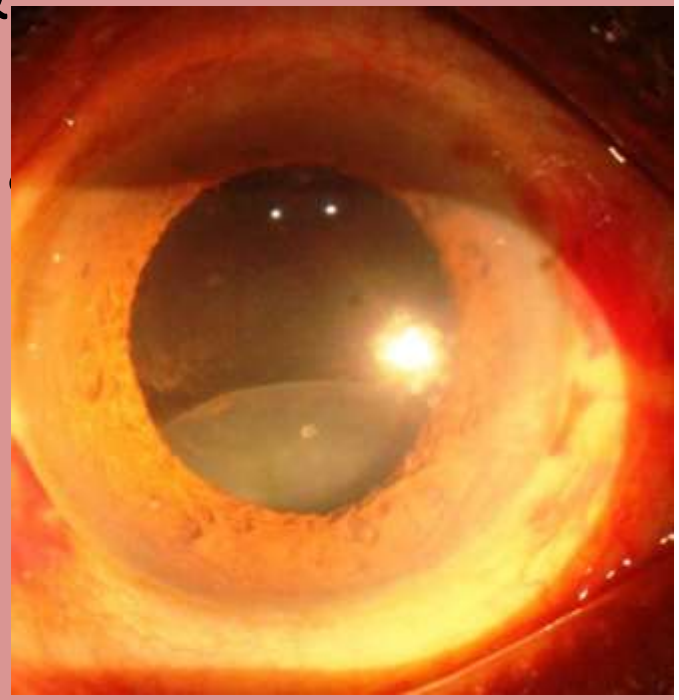
- Following trauma causing bleeding in the vitreous cavity
- 1-3 weeks after the initial trauma
- RBC change their shape and consistency becoming spherical, rigid and containing Heinz bodies (degenerated hemoglobin)
- Ghost cells reach AC through a disrupted anterior hyaloid face after trauma
- Clog TBM leading to increased IOP

- **3)Hemolytic Glaucoma (Rare):**
- Hemolysis of RBC from bleeding in the vitreous body
- Released debris, free hemoglobin and macrophages laden with hemoglobin obstruct TBM

- **4)Hemosiderotic Glaucoma (Very Rare):**
- Caused by the toxic effects of iron on TBM
- Source of iron either longstanding VH or a RIOFB(iron)

5)Lens dislocation/subluxation

- Anterior dislocation of the lens-pupillary block and acute ACG
- Post.dislocation –vitreous in AC & pupil block glaucoma
- Oen angle-most cases of glaucoma secondary to lens subluxation
- Postulated mechanisms-intermittent closure of the angle by dislocated lens,uveitis secondary to the dislocated lens, occult phacolytic glaucoma or obstruction of TBM by vitreous displaced in the anterior chamber



Traumatic Glaucoma secondary to Penetrating injury

- Glaucoma through many mechanisms including discussed in the blunt trauma section
- **Other mechanisms include-**
- Injury to the cornea ⇒ shallow AC + significant inflammation ⇒ extensive anterior synechiae secondary ACG
- Posterior synechiae ⇒ seclusion of the pupil and iris bombe ⇒ secondary ACG
- Injury to lens ⇒ liberation of lens material severe inflammation + mechanically obstruct TBM

- Hydrated lens with an enlarged anteroposterior dimension-anterior iris bowing and angle closure.
- **Epithelial down growth** in the AC and obstruction of the meshwork by epithelial sheets of cells & contracture of sheets ACG
- **Fibrous ingrowth**
- **Siderotic glaucoma**

Work Up

- History
- **Physical Exam**
- Visual inspection of adnexa & globe
- VA,Pupillary reaction
- Slit lamp examination
- **Gonioscopy**-rule out open globe **injury-better to avoid in acute stage**
- Dialated eye exam-look for ZD
- Indirect Ophthalmoscopy

Gonioscopic signs of injury include:

- Iris root displacement posteriorly and a widened ciliary body face (in angle recession)
- White- gray membrane covering the angle (also in angle resection)
- Cyclodialysis cleft (disinsertion of the ciliary body from the sclera leading to aqueous flow to the suprachoroidal space and often associated with hypotony)
- Trabecular meshwork flaps that are hinged at the level of the scleral spur (in superficial tears of trabecular meshwork disruption)
- Torn iris processes with blood in the angle (in angle recession)

- Imaging-UBM

  ZD,Angle recession,Cyclodialysis cleft

- AS OCT

- Perimetry

Management

- Treatment of underlying cause
- Antiglaucoma-mainstay of treatment
- Beta Blocker,topical/systemic carbonic anhydrase inhibitor
- Avoid CAI in sickle cell hyphema
- Avoid Prostaglandin analogues,pilocarpine
- Steroid,cycloplegics for inflammation
- Surgical t/t-trab/drainage device

Hyphema

- Prevent re bleeding
- Control IOP,inflammation

Surgical intervention generally should be considered in the following cases

- Resistant IOP despite maximum medical therapy.
- **IOP >50 mmhg >5 days, >35 mmhg for >7 days**
- **Persistent 100 % hyphema** (also known as eight ball hyphema).
- When hyphema is persistent for a period of days without signs of improvement: example more than 50 % for 10-14 days
- Eyes manifesting **early corneal blood staining**.
- Eyes in which there is a detection of active rebleeding.
- **Sickle cell anemia** or trait.

- AC wash by paracentesis,sometimes vitreous cutter required

Open globe

- Meticulous attention while repairing
- Mx of epithelial cyst-mechanical removal+cryotherapy

Summary

- Can arise from any kind of trauma
- Can manifest early to late
- Control the IOP &Treat the underlying cause
- Associated ocular injuries need attention
- Regular follow up of trauma cases mandatory

Thank You