Ocular Trauma

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Definition

- Ocular trauma is defined as the result of mechanical,electrical,thermal or chemical energy damage to the eye.

Epidemiology-

Globally

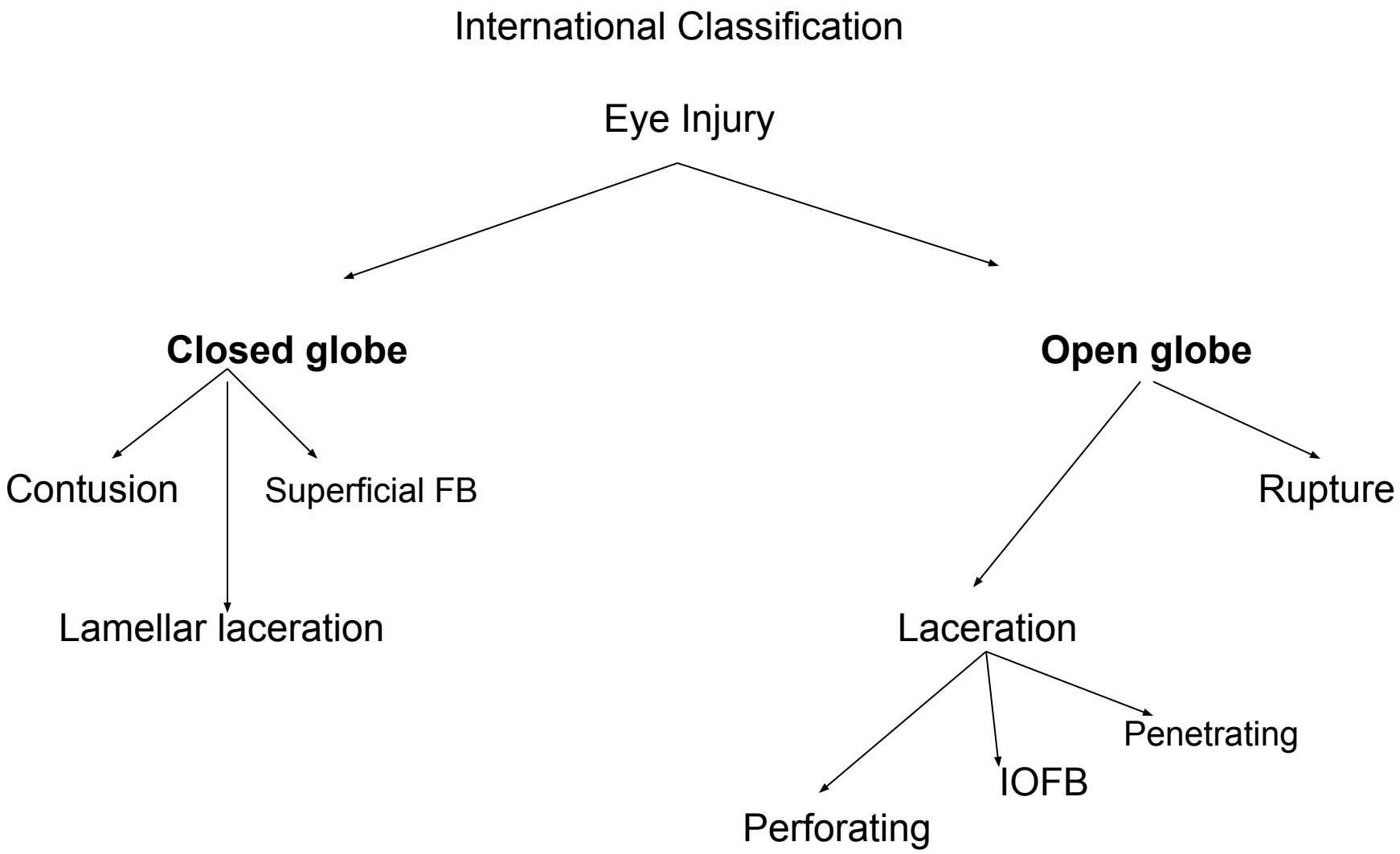
Incidence - 55 million ocular injuries /year

Prevalence-

Blindness due to injuries-1.6 million

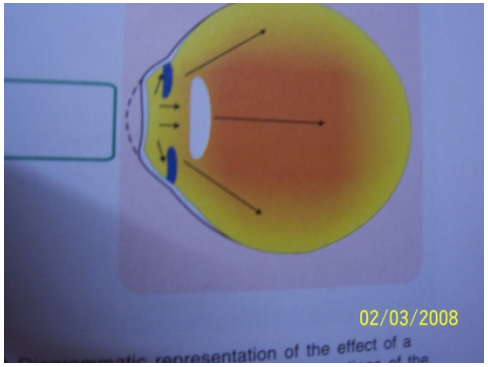
(V/A<3/60)

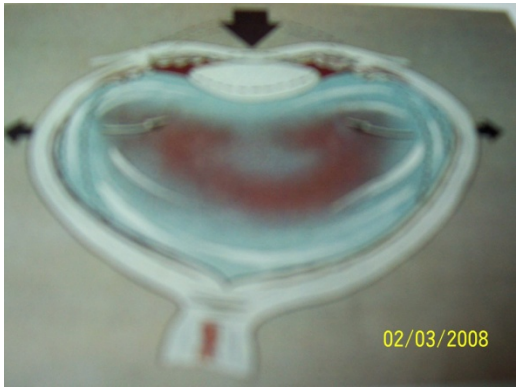
Visual impairment - 19 million


International Classification
Eye Injury
Closed globe
Open globe
Contusion
Superficial FB
Lamellar laceration
Rupture
Laceration
Penetrating
IOFB
Perforating

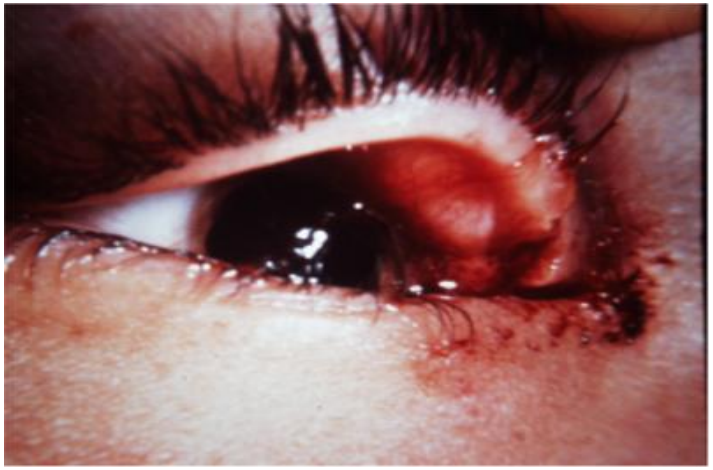
Blunt Trauma-

Mechanism –

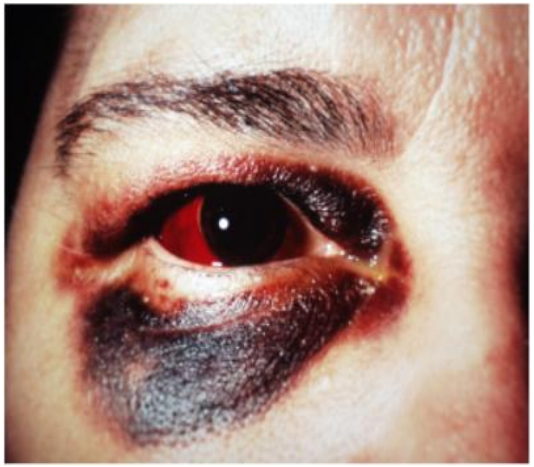




Lid injuries-

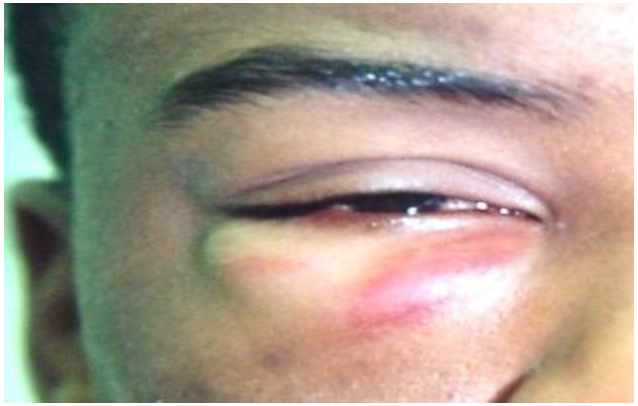


Lacerations

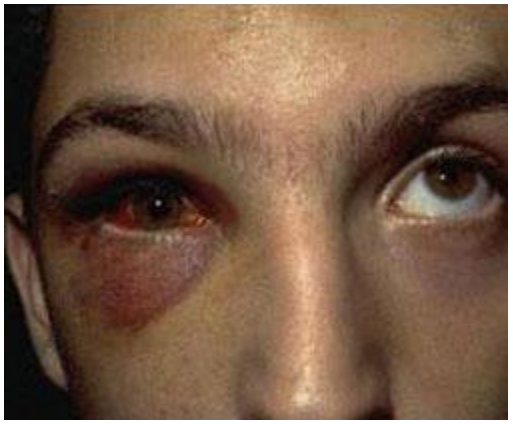


Black Eye

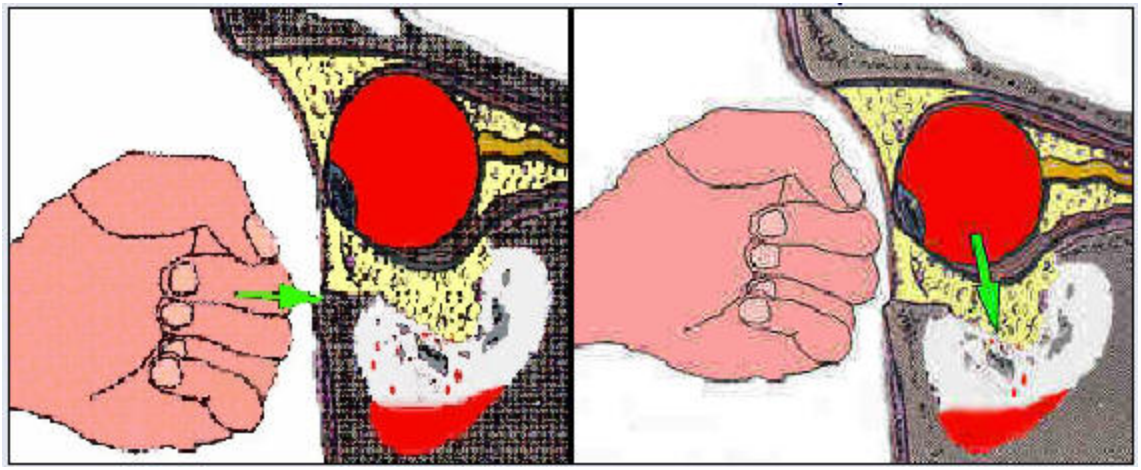
Orbital Injuries



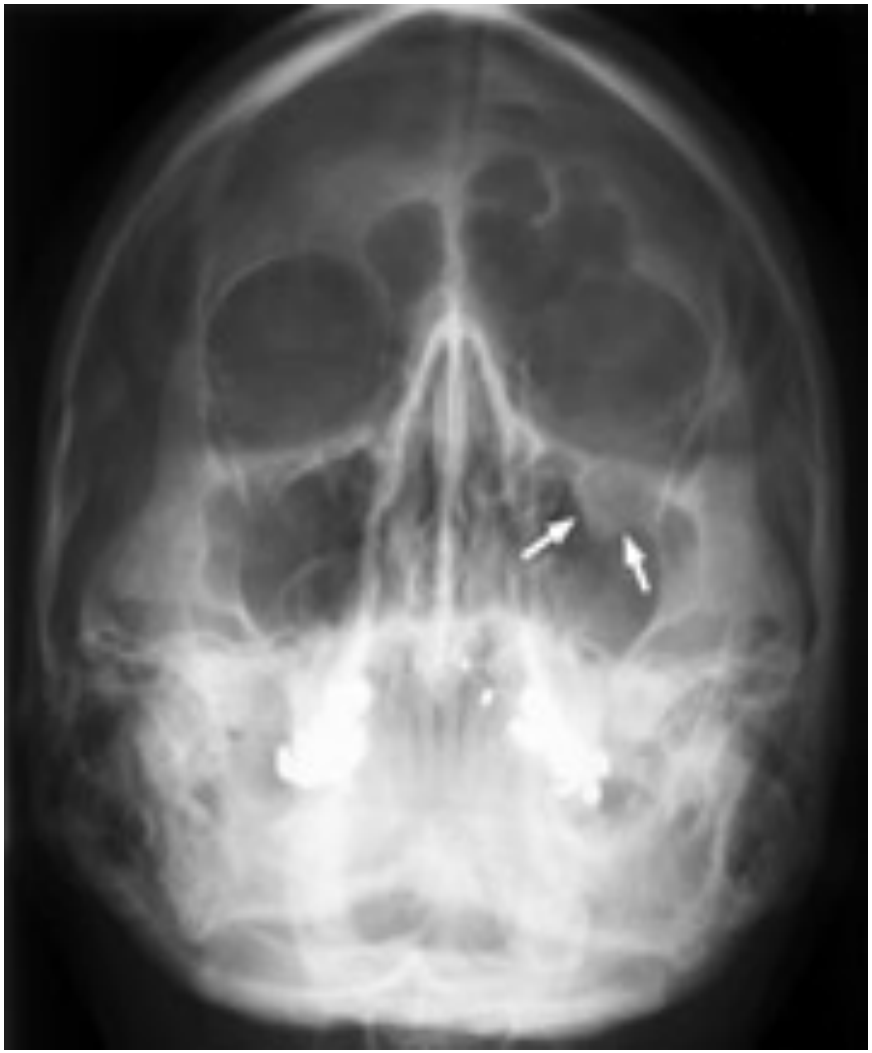
Orbital Emphysema



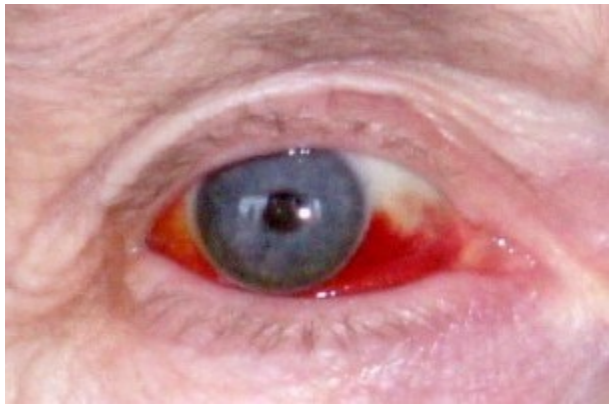
Blow out #



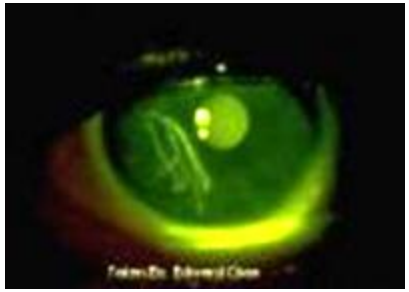
Tear –Drop sign



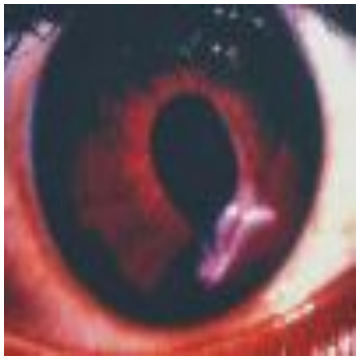
Injuries of Conjunctiva , Cornea & Sclera



Laceration& H-age

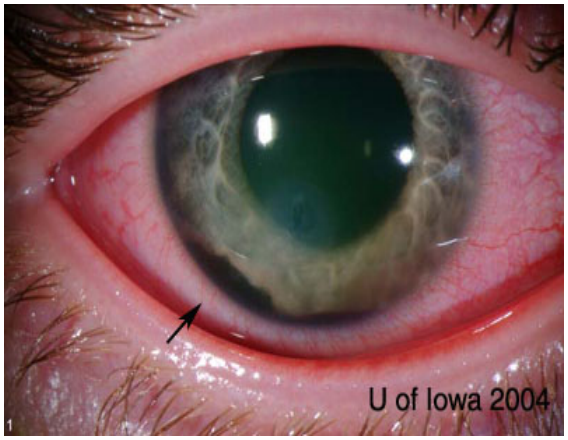


Abrasion

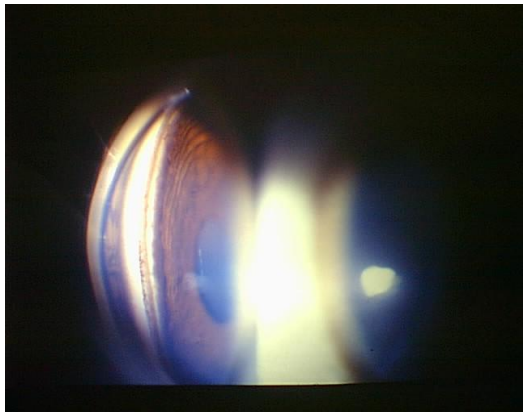


Rupture

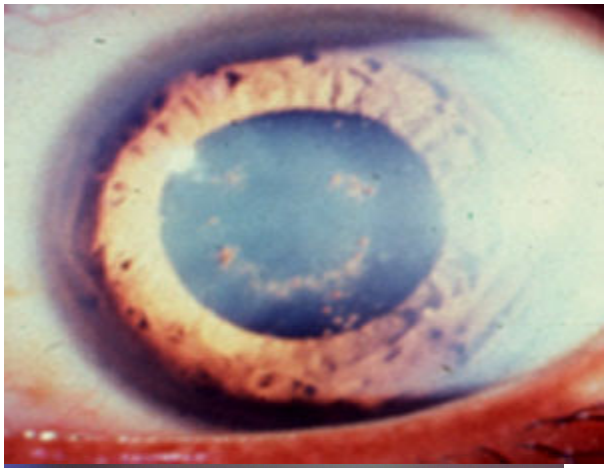
Injury to Iris, Angle &Traumatic glaucoma



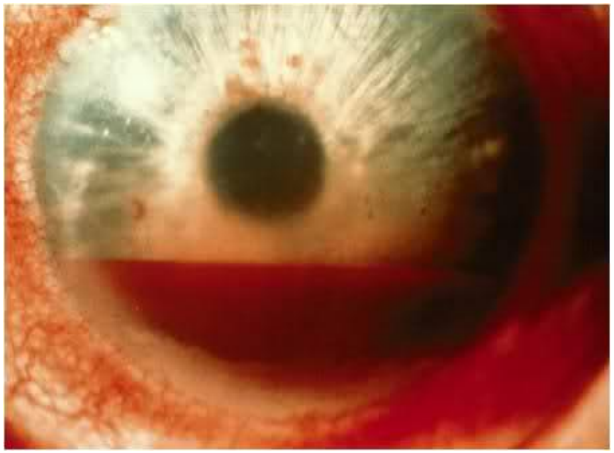
Iridodialysis



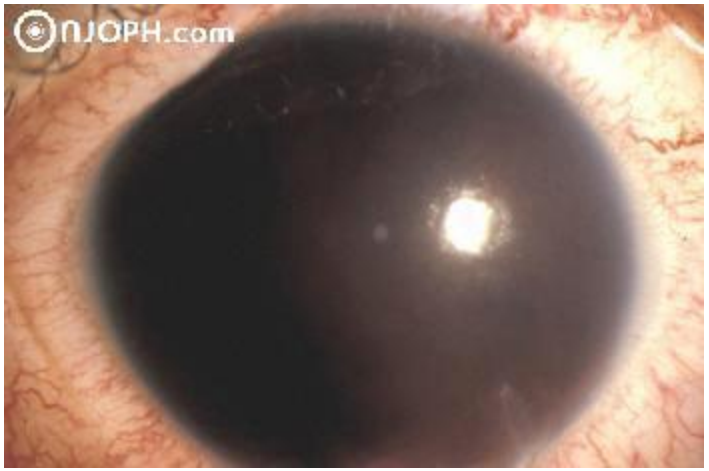
Angle recession



Vossius ring



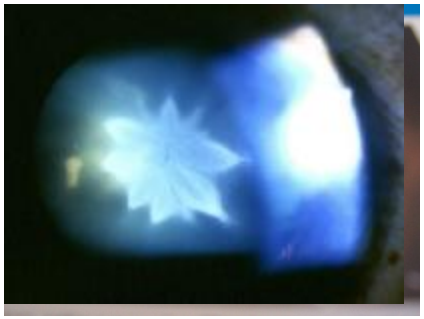
Hyphaema



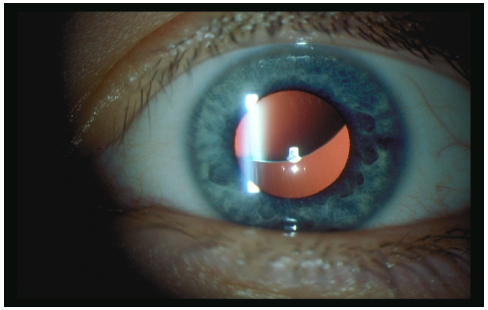
8Ball hyphaema

Corneal staining

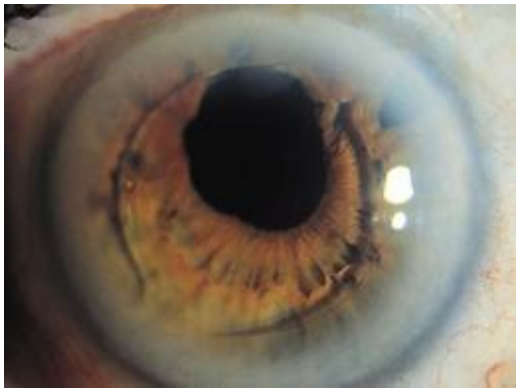
Lens injuries



Rosette cataract

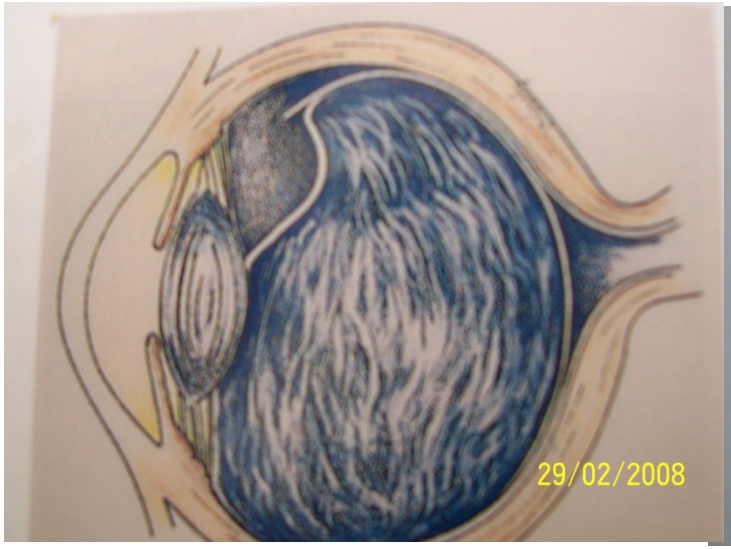


Posterior dislocation

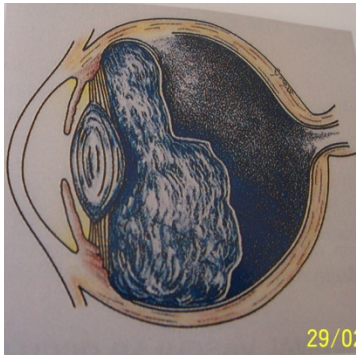


Anterior dislocation

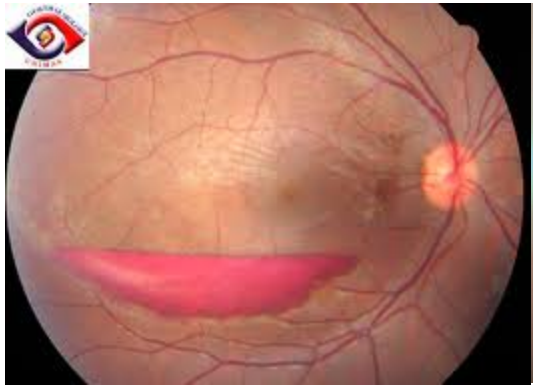
Vitreous& Retinal injuries



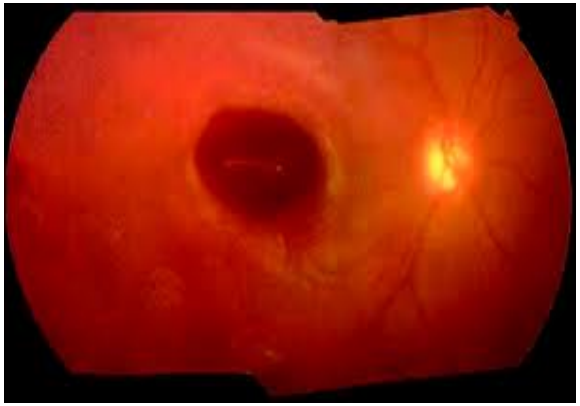
Vitreuos base detachment & Retinal Dialysis



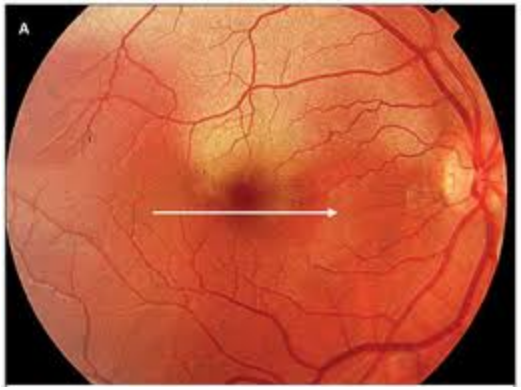
PVD

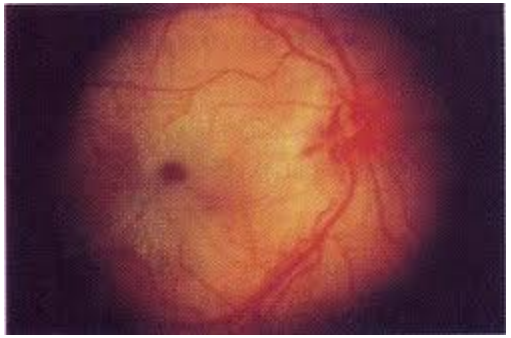


Subhyloid H-age



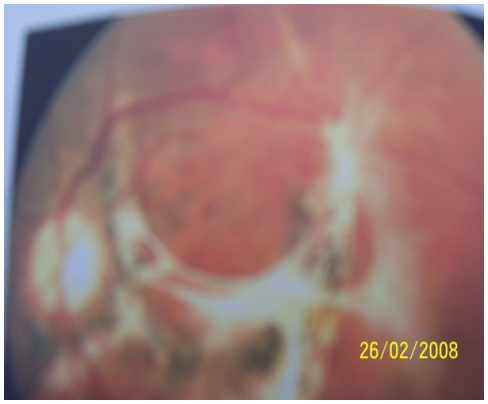
Macular H-age



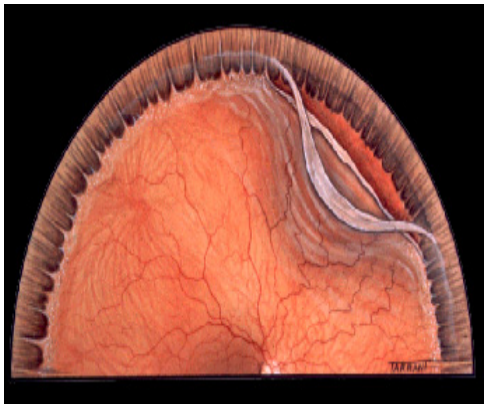


Commotio Retinae

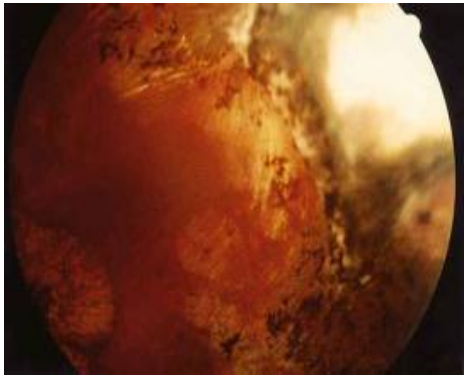
Choroidal Rupture



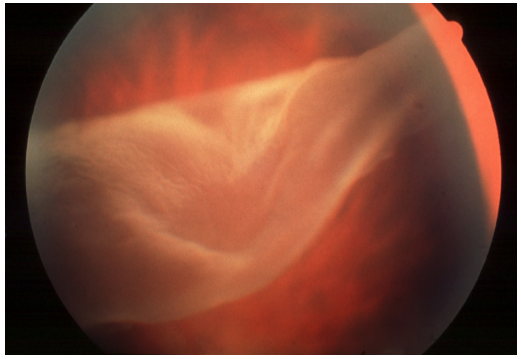
PVR



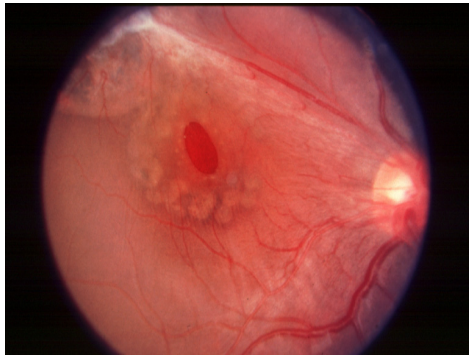
Avulsion of vitreous base & retinal dialysis



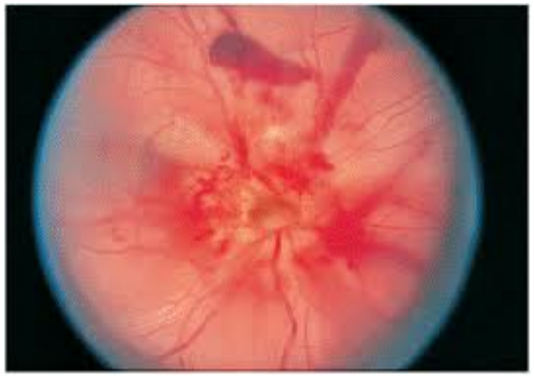
Retinitis sclopetaria



Equitorial tears



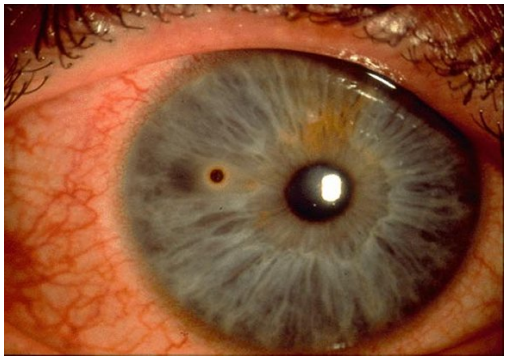
Macular hole

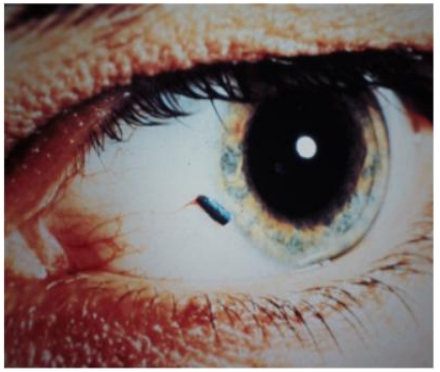


Optic nerve head avulsion

Optic atrophy

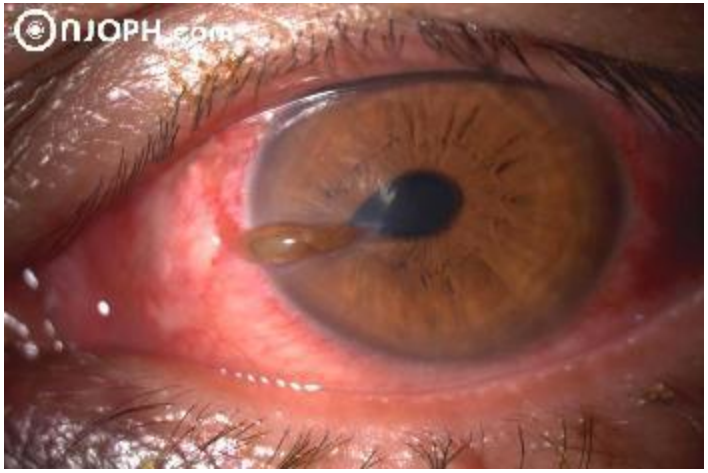
Superficial FBs

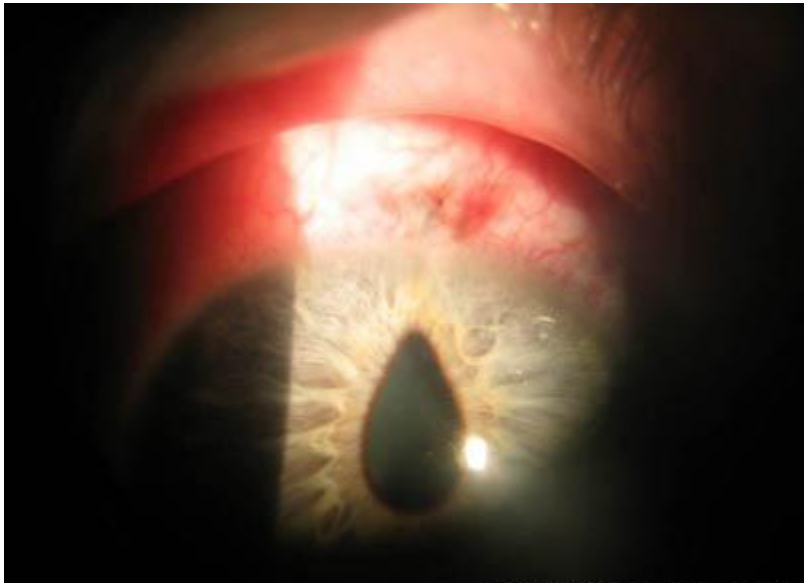




Penetrating Injury

Corneal Perforation with/without iris prolapse





Peaked pupil in corneo-scleral tear

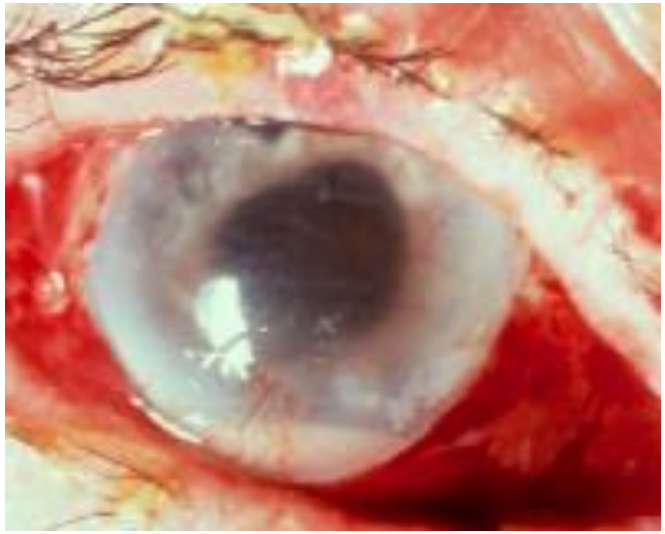
Consequences-

Post traumatic iridocyclitis

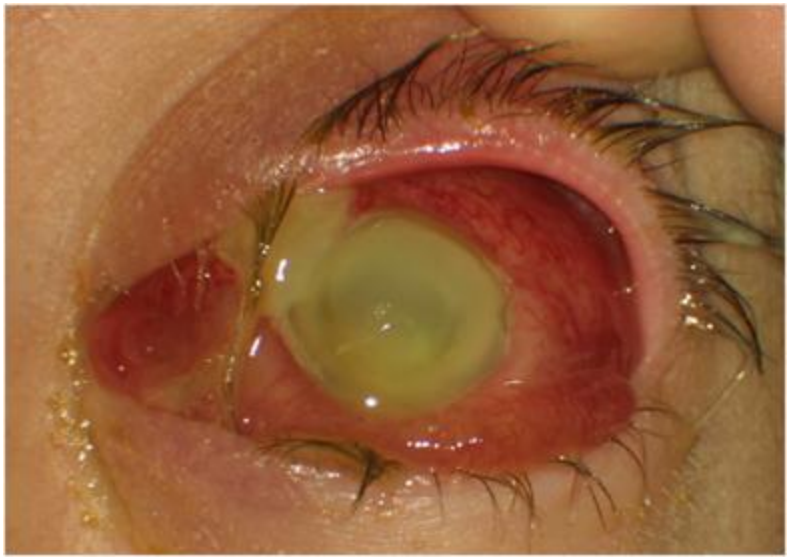
Infection

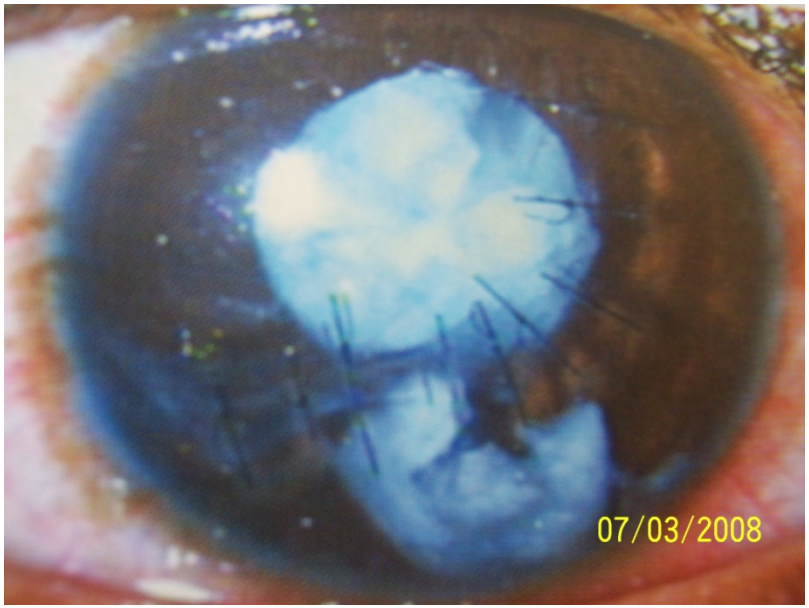
Sympathetic Ophthalmitis

Endophthalmitis



Panophthalmitis



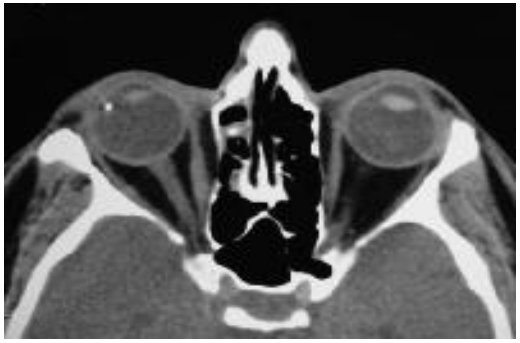


Cataract

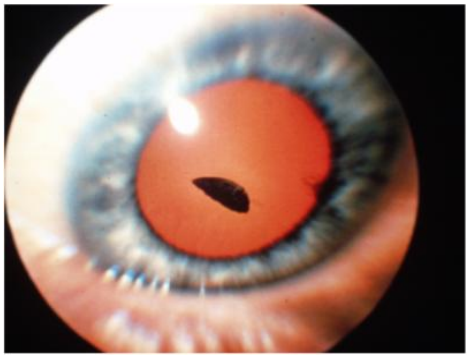
Penetrating wounds with retention of foreign body(RIOFB)

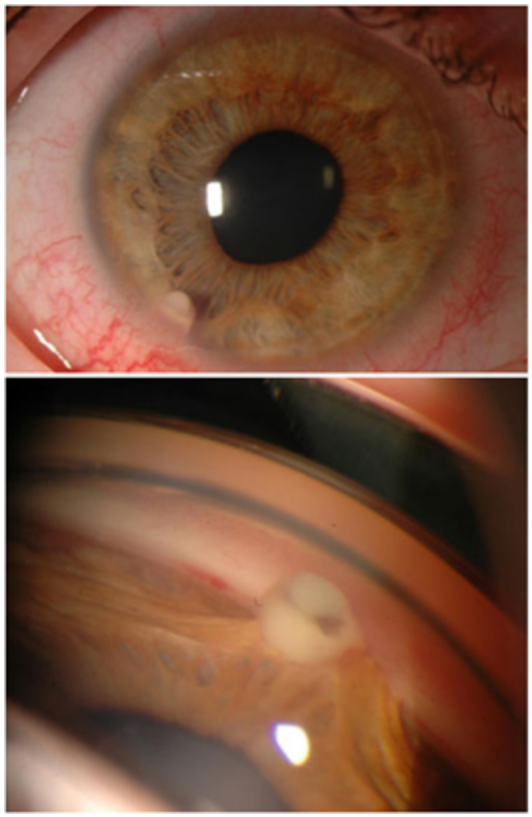
-90% iron/steel (Industrial injuries)
-stone
-glass
-lead pellets
-Cu percussion caps

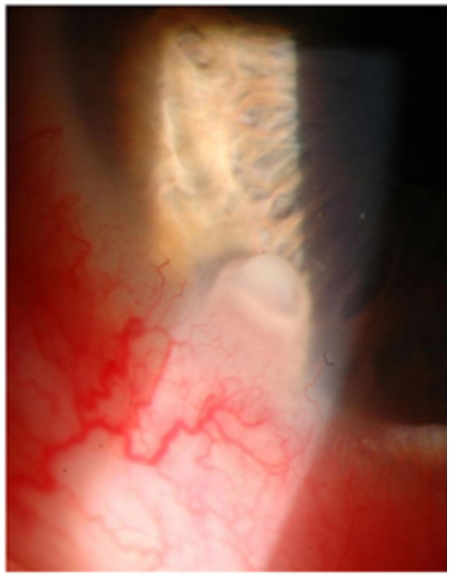
Size & Velocity of missile is important



Tract in the Iris & lens

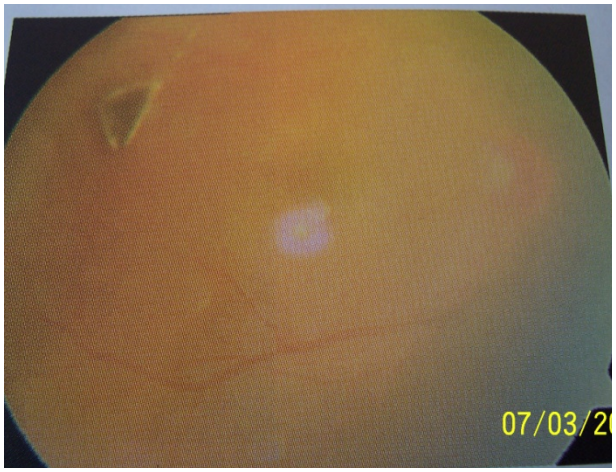


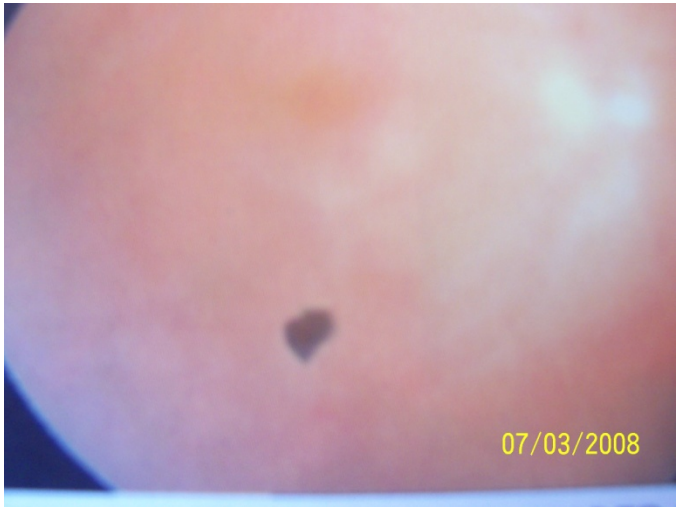


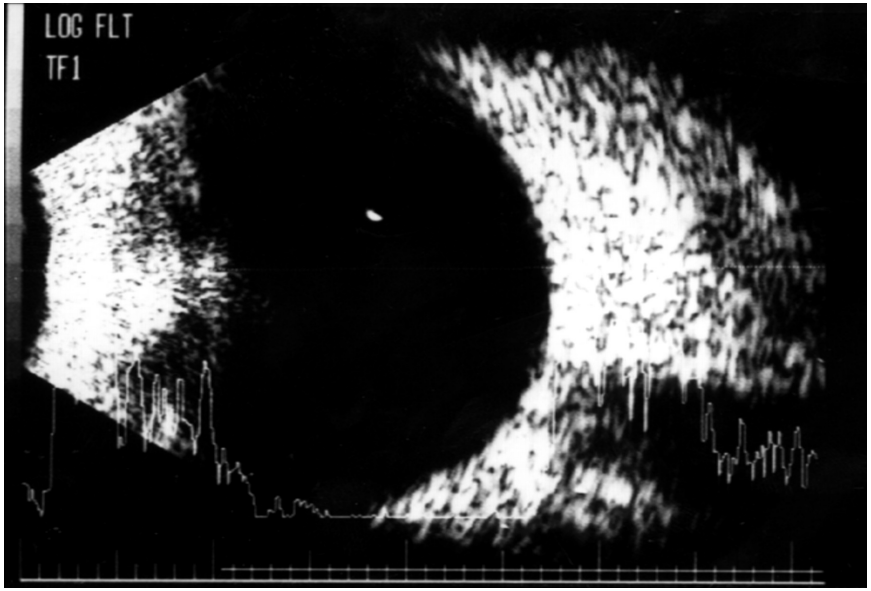


FB in the angle

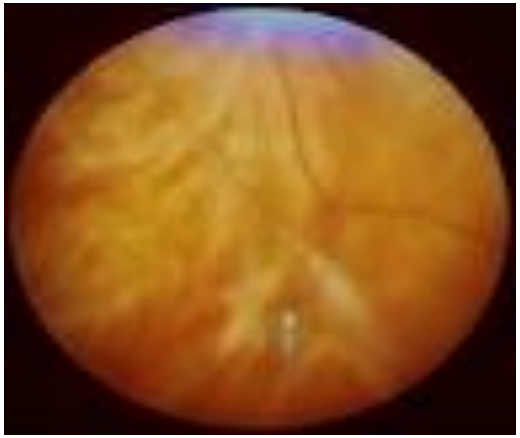
Tract in the vitreous & liquefaction of vitreous

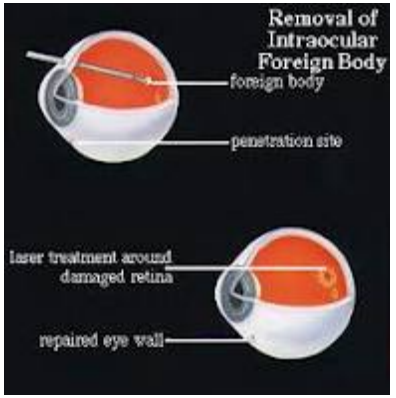






FB on the retina





Double perforation –FB in the orbit

Foreign body removal forceps

FB causes damage by:-

Mechanical effects

Introduction of infection

Specific action on the intraocular tissues

Lodgment of FB in the Posterior Segment can cause-
Widespread degeneration

Pigment disturbance at the macula

Concussion effects

Vitreous liquefaction

Vitreous H’ge

Fibrous proliferation in the vitreous

Retinal detachment

Infection-

Small flying metallic objects are rendered sterile.

Infection occurs because of wood/stone.

Prognosis bad despite prophylactic antibiotics.

Reaction of ocular tissues to FB-

Non organic FB-

Inert- delayed onset iridocyclitis

Glass,plastic,porcelain

Gold,silver,platinum,titanium

Lead-Coated with carbonate→less reaction

Fibrosis & Encapsulation

Aluminium- powdered →local reaction

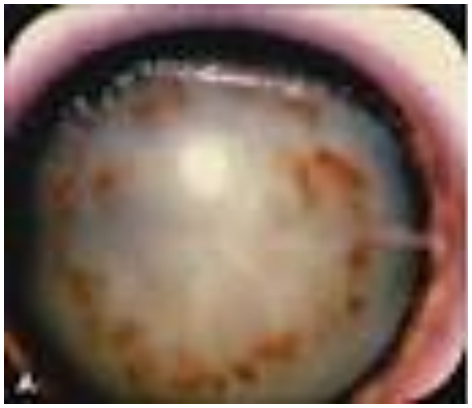
Suppuration-Zn,Ni,Hg

Degeneration-Fe&Cu are widely distributed in the eye due to electrolytic dissociation.

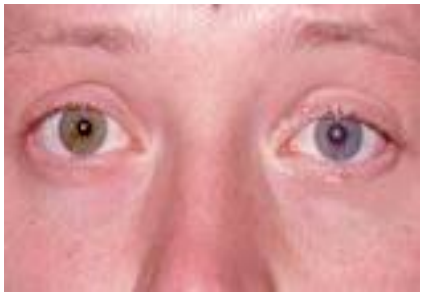
Iron/Steel depending on ferrous content-
Siderosis

Iron combines with cellular proteins→ damage esp to epithelial cells
→atrophy.

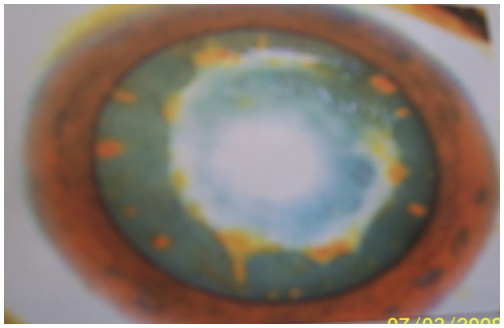
Earliest Manifestation-Deposition in the anterior lens capsular cells



Oval patches of rusty deposits of the size of dilated pupil.



Iris heterochromia



Sphincter atrophy- Mydriasis

Retinal blood vessels attenuation.

RP like pigmentation.

ERG- amplitude of a wave as

condition progresses b wave also↓

ERG becomes flat.

Prussion blue stain.

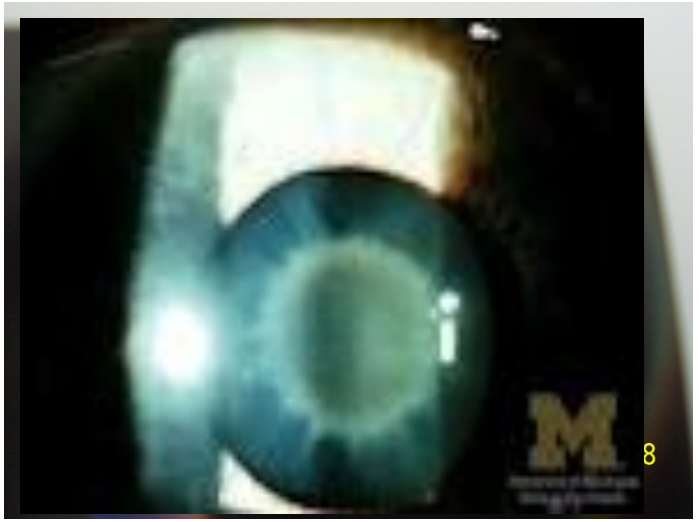
Copper-

Pure Cu- violent reaction→ profuse fibrosis
→encapsulation/Suppuration →phthisis

Alloy-Chalcosis
Cu is deposited where resistance to migration occurs due to continuous membranes like DM

Kayser Flaisher ring

Sunflower cataract



History
Thorough exam
Wound of entry
Gonioscopy
Tracks in lens
Fundus exam
Radiography-Caldwell and Lateral view
Limbal ring/ Contact lens- Meridian
Distance from limbus
CT
MRI-wood and vascular changes detected
Contraindicated in mettalic FB
USG
Locater

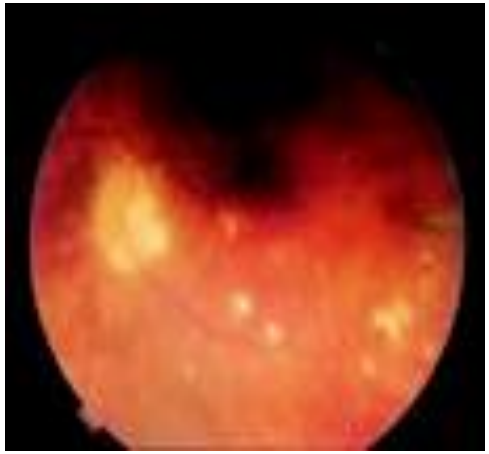
Treatment –

Removal

Intravitrial magnets

Lens extraction

Sympathetic Ophthalmitis



Dalen Fuch’s nodules

Chemical Injuries Of The Eye

Common causes of chemical injuries

Class	Compound	Sources	Comments
Alkali	Ammonia [NH_4]	Fertilizers Cleaning agents, refrigerant	Combines with water In tear film to form NH_4OH Rapid deep entry
	Lye NaOH	Drain Cleaner	Rapid deep entry
	$Mg(OH)_2$	Sparklers	Thermal&Alkali injury
	Lime $Ca(OH)_2$	Plaster Cement White Wash	Most common cause Poor penetration Toxicity by retained particles

Acid	Sulphuric	Battery acid	Combines with water to produce charring may be associated with FB/laceration
	Sulphurous	SO_2Fruit/Veg preservative Bleach Refrigerant	Penetrates more easily than other acids
	Hydro fluoric acid	Glass etching	Penetrates easily Causes most severe acid injury
	Acetic	Vinegar	Mild with lesser severe with higher concentration

Pathophysiology-

Severity related to surface area of contact & degree of penetration.

Alkalies penetrate deeper

Depending on degree of penetration there may be damage to

Corneal & conjunctival epithelium, limbal stem cells,

keratocytes,stromal nerve endings,

endothelium, lens,ciliary body and vascular endothelium

of conjunctiva,episclera,iris,and ciliary body.

The depth of ocular surface penetration & possible limbal stem cell damage can be evaluated indirectly by

Vascular ischaemia

and

Necrosis of limbal & bulbar conjunctiva.

Thoft classification-

Grade I- Little/no loss of limbal stem cells and presents with little/no ischaemia

Grade II- Subtotal loss of limbal stem cells and ischaemia of less than one half of limbus

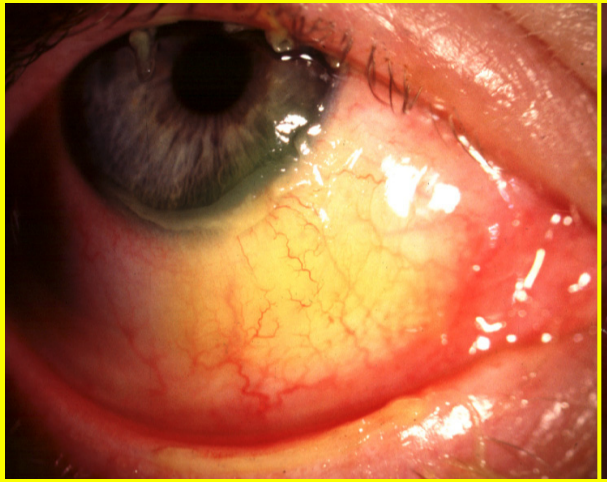
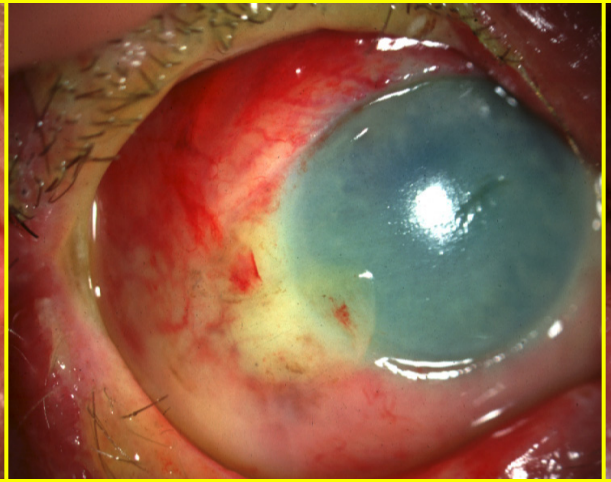
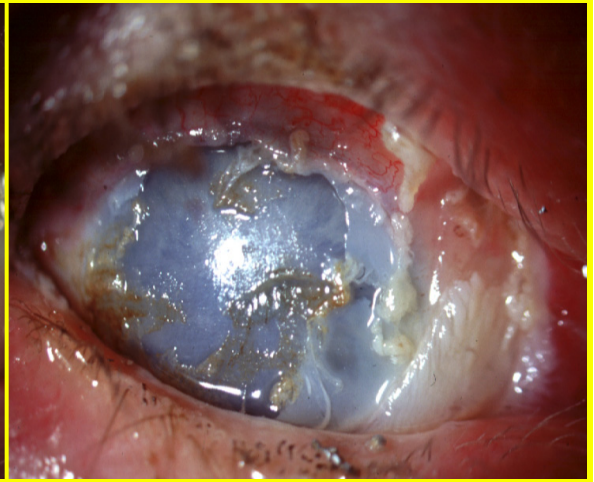
Grade III- Total loss of limbal stem cells with preservation of proximal conjunctival epithelium and presents with ischaemia of one half to entire limbus.

Grade IV- Total limbal stem cell loss as well as loss of proximal conjunctival epithelium presents with extensive damage to the entire anterior segment.

Grading of severity of chemical injuries

Grade I (excellent prognosis)

- Clear cornea
- Limbal ischaemia - nil

Grade II (good prognosis)	Grade III (guarded prognosis)	Grade IV (very poor prognosis)
		
• Cornea hazy but visible iris details • Limbal ischaemia < 1/3	• No iris details • Limbal ischaemia - 1/3 to 1/2	• Opaque cornea • Limbal ischaemia > 1/2

The principles guiding evaluation and management are based on addressing the following pathophysiologic mechanims-

1. Regeneration of ocular surface epithelium and its state of differentiation

2. Stromal matrix remodelling including repair and degradation

3. Infection.

Pathophysiologic & Clinical course-McCully

Phase	Period	Patho physiology	Evaluation	Treatment
Immediate			Extent Depth Toxicity Concentration	Thorough wash for 30 min till neutralization Removal of particles under L.A Debridement
Acute	0 -7 days	Within 0 -24 hrs Peripheral PMN Infiltration IOP Re epithelization MMP-9 Degradation MMP1,8 &Remodelling of stroma.	Re epithelization IOP Progressive inflammation	Topical- corticosteroids 2 hrly 10% Na ascorbate 2hrly 10 % Na citrate 2 hrly 1% Tetracycline ointment Qid Antiglaucoma T/t Cycloplegics Lubricants Oral-Na ascorbate 1g Qid Doxycycline 100 mg Bid Gr-IV-Conjunctival &Tenon'advancement

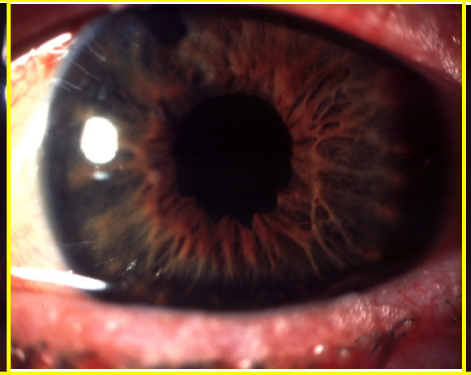
Early repair	7 -21 days	Epithelial migration in less severe injuries 14 -21 days maximum collagen synthesis Collagenolysis 2nd wave of inflammatory cell infiltration & persistance till lack of epithelization &/stimulus from necrotic conjunctival tissue	Epithelization defects & change in ischaemic pattern.	Taper topical steroids after close monitoring Topical progestational steroids NSAIDs/both 2 hrly Continue other T/t
Late repair	21 days – several months	Balance of degradation and collagen synthesis depends on epithelization	Healing pattern	Taper medical therapy after reepithelization (Gr-II) Perform ocular surface transplantation(Gr-III/IV) Perform tectonic procedures tissue adhesive Keratoplasty Large diameter keratoplasty Keratoprosthesis only if absolutely necessary. Treat sequelae

Revision

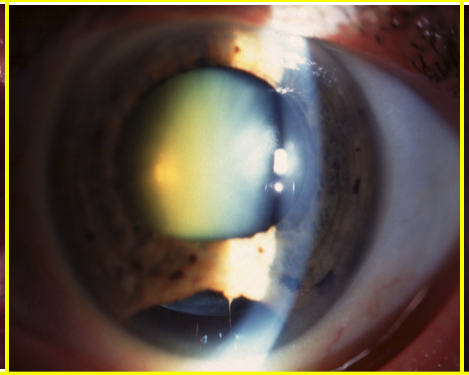
- What are the effects of blunt trauma on the anterior segment of the eye?

Anterior segment complications of blunt trau

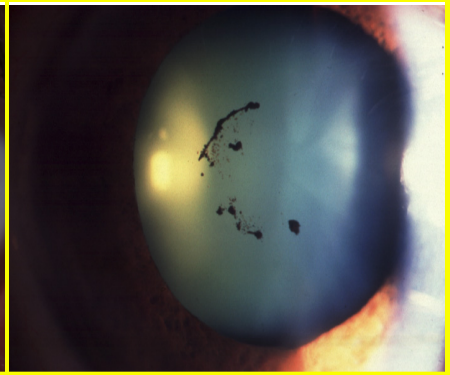
Hyphae



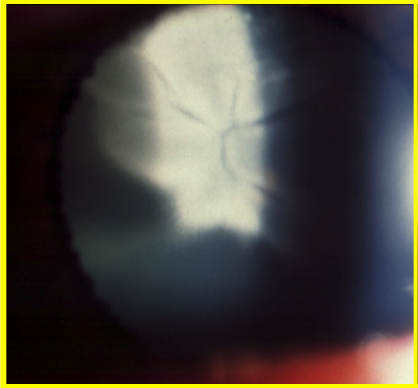
Sphincter tear



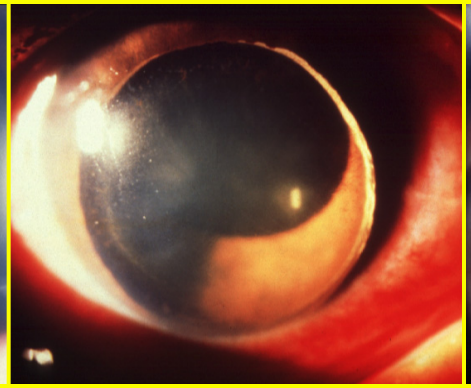
Iridodialysis



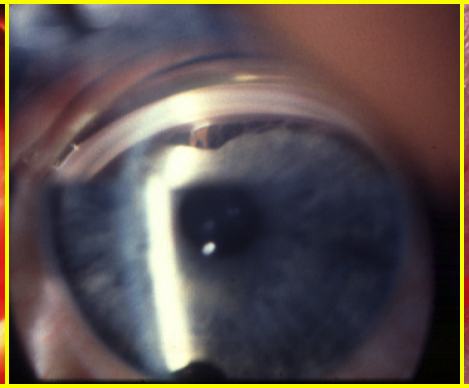
Vossius ring



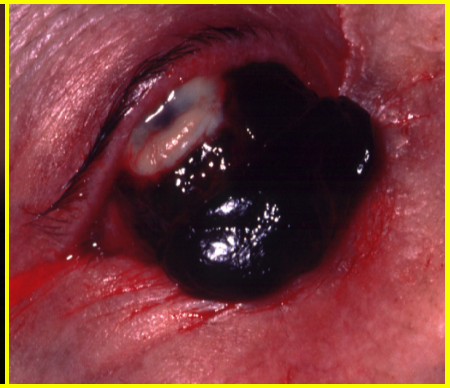
Cataract



Lens subluxation



Angle recession

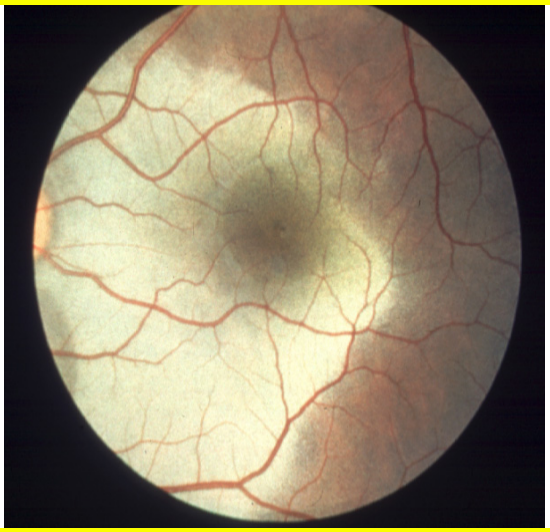


Rupture of globe

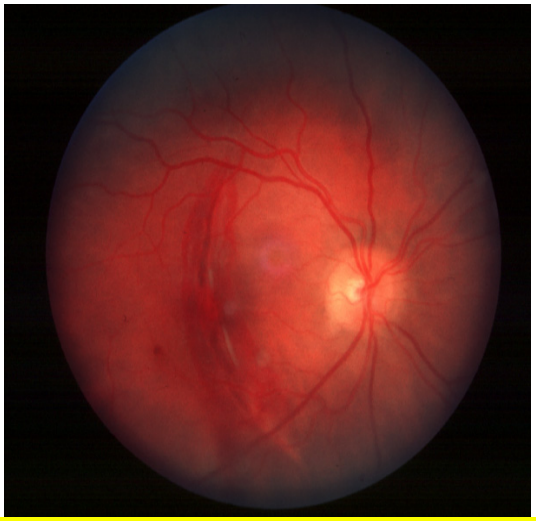
Q-2

- What are the effects of blunt trauma on the posterior segment of the eye?

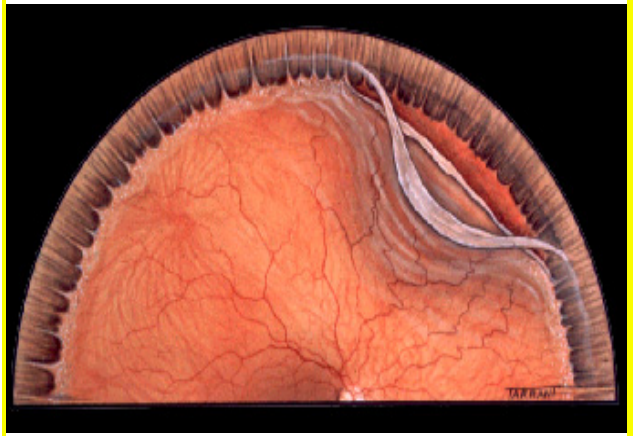
Posterior segment complications of blunt trau



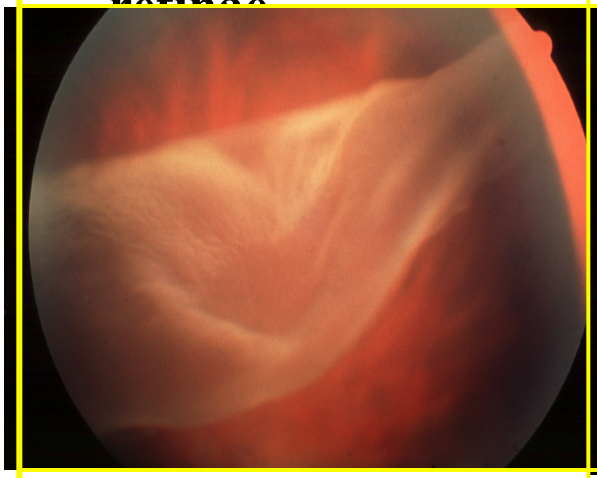
Commotio retinae



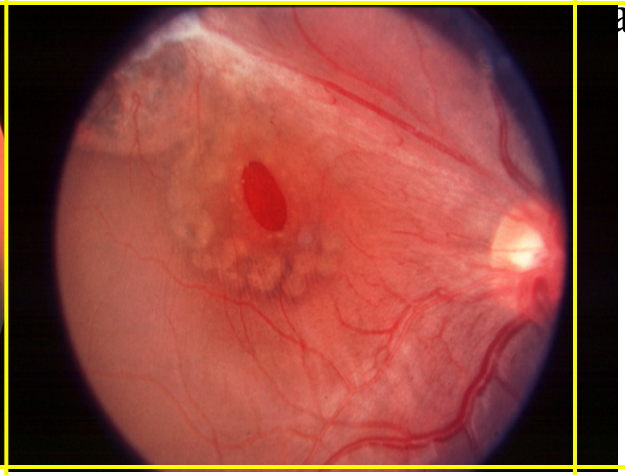
Choroidal rupture and



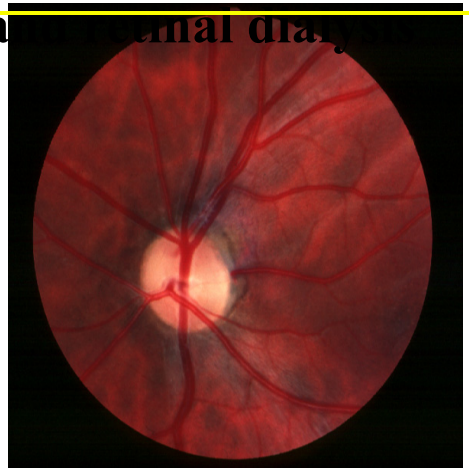
Avulsion of vitreous base



Equatorial tears



Macular hole

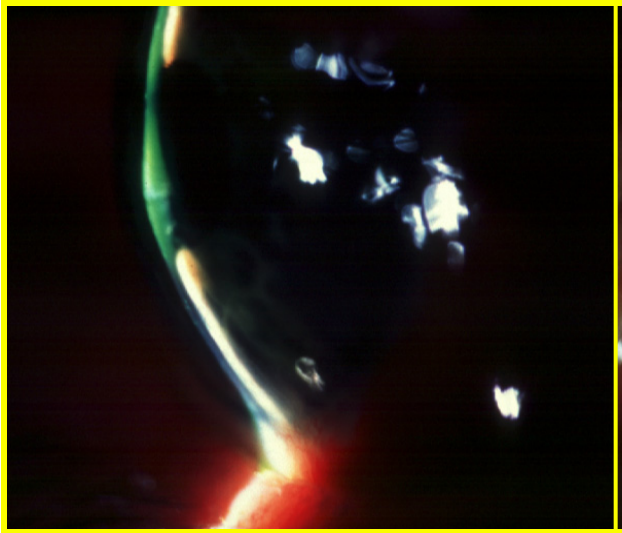


Optic neuropathy

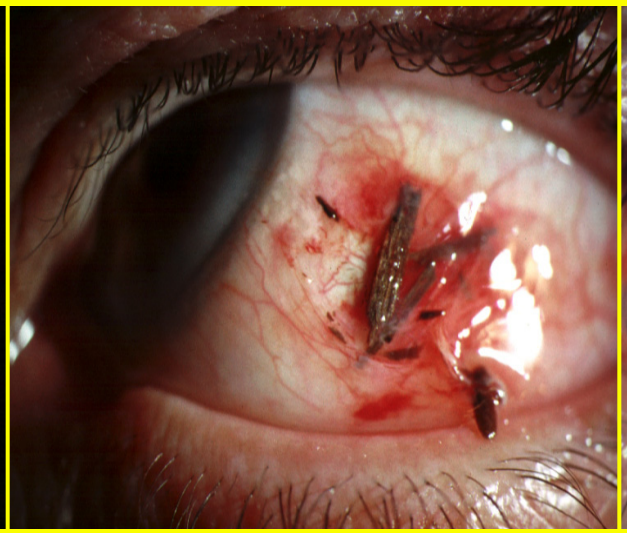
Q-3

- What are the complications of penetrating trauma?

Complications of penetrating trauma

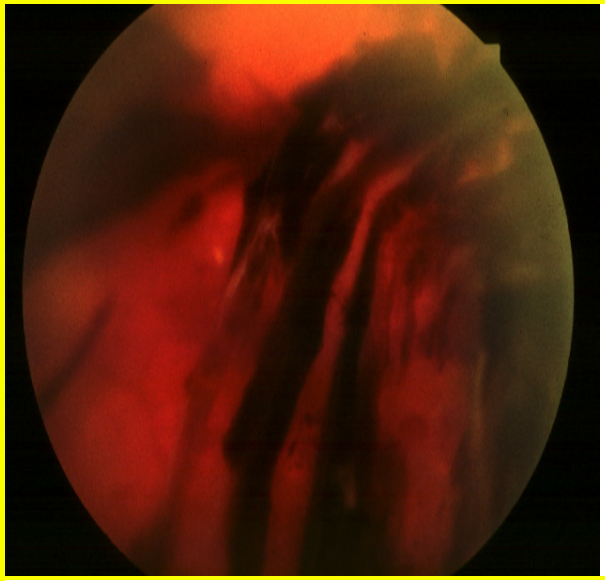


Flat anterior

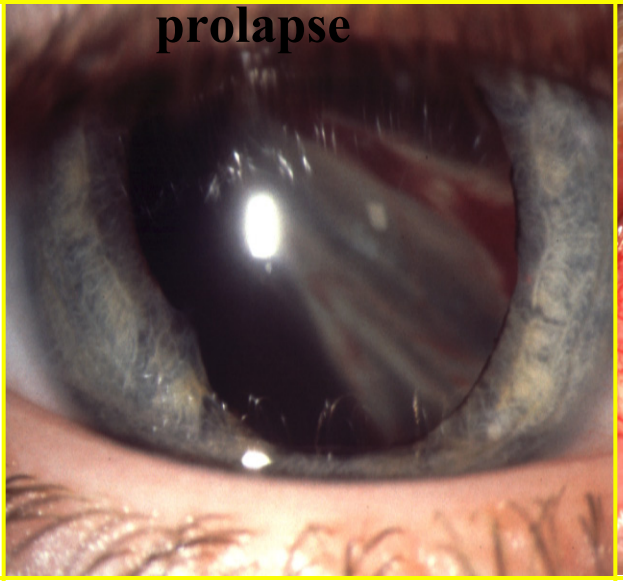


Uveal prolapse

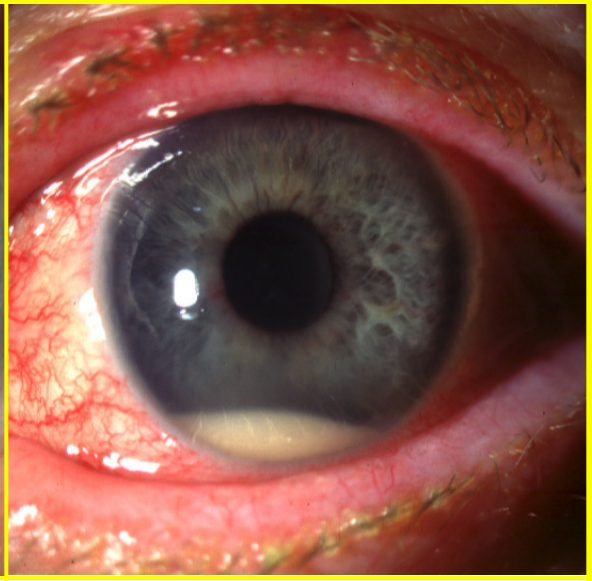
Damage to lens and



Vitreous haemorrhage



Tractional retinal detachment



Endophthalmitis

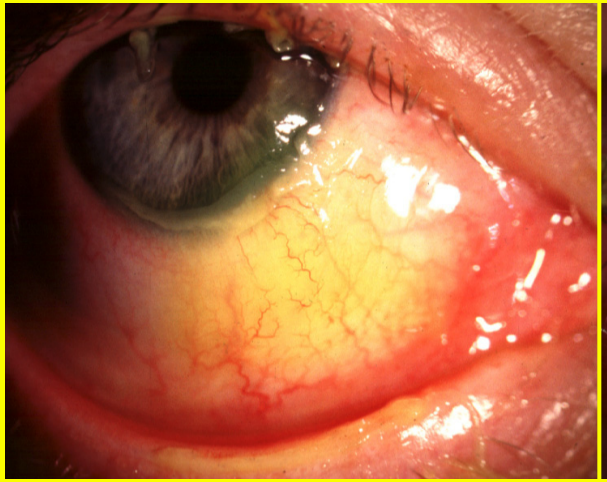
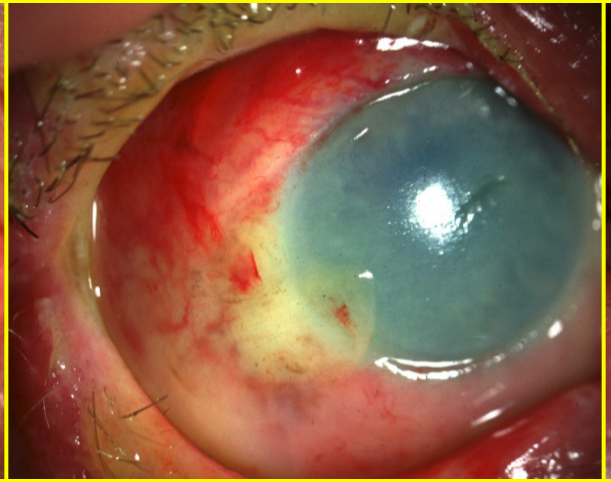
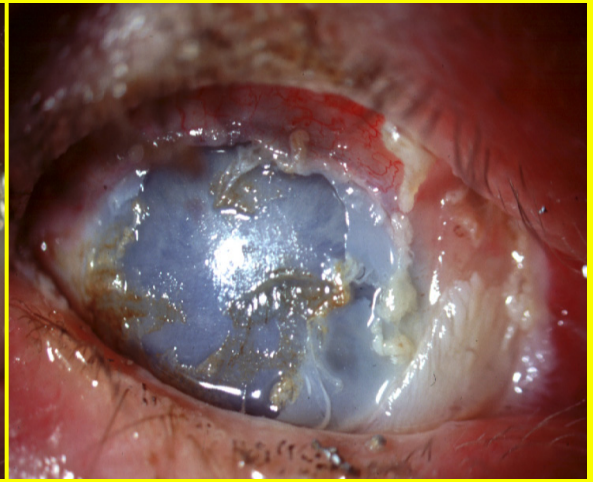
Q-4

- What are the grades of chemical trauma?

Grading of severity of chemical injuries

Grade I (excellent prognosis)

- Clear cornea
- Limbal ischaemia - nil

Grade II (good prognosis)	Grade III (guarded prognosis)	Grade IV (very poor prognosis)
		
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