Trauma to the eye, lids, foreign body chemical injuries

➢ Trauma to the eye

❖ Definitions from dictionary:

- A deeply distressing or disturbing experience.
- A serious injury or shock to the body, as from violence or an accident.
- An event or situation that causes great distress and disruption.

❖ Ocular Trauma

- The eye is protected from direct injury by lids, eyelashes and the projecting margins of the orbit. Nevertheless, it can be injured in a variety of ways; by chemicals, heat, radiation and mechanical trauma.

❖ Some key features of ocular trauma:

- It is number one ocular emergency.
- Leading cause of blindness, irrespective of age, sex and geographical status (40% of monocular blindness).
- Male & young age group is greater in incidence rate.
- Efficient referral expected from the professionals.
- Every person should know about the importance of quick response to an ocular injury.
- Prophylactic measure is always better than management.

❖ Classification of Trauma

- **Etiological Classification**

1. Accidental trauma.
2. Self-inflicted trauma.
3. Occupational trauma.

❖ Classification according to nature

1. Physical trauma
    a. Perforating
    b. Nonperforating

c. Blunt trauma

2. Chemical trauma
   a. Acid
   b. Alkali
   c. Dye (Salt of acid or alkali)
3. 3. Thermal trauma
   a. Heat
   b. Cold
4. Radiation trauma
   a. lonizing agents
   b. Ultra violet rays
   c. Laser burn
5. Miscellaneous

❖ **Uniform classification based on primary evaluation; Mechanical trauma to the eye is of two types:**

1. Open globe injuries

- Full thickness defect of eye coats.

2. Closed globe injuries

- Injuries without full thickness of eye coats.

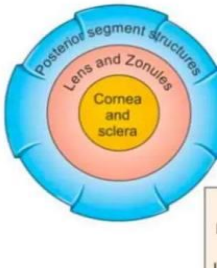
Close globe injury classification

Type
1. Contusion
2. Lamellar laceration
3. Superficial Foreign body
4. Mixed

Grade – Visual acuity
1. >6/12
2. <6/12 – 6/60
3. <6/60 – 1/60
4. <1/60 – light perception
5. No light perception

Pupil
1. Positive – RAPD +
2. Negative – No RAPD

Zone



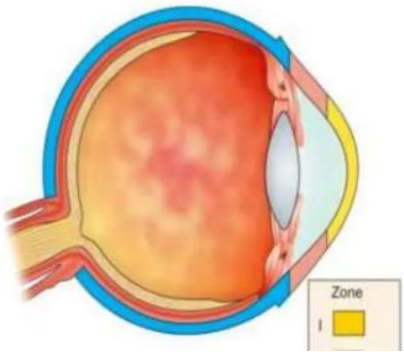
Open globe injury classification

Type
1. Rupture
2. Penetrating
3. Intraocular
4. Perforating
5. Mixed

Grade – Visual acuity
1. > 6/12
2. <6/12 – 6/60
3. <6/60 – 1/60
4. <1/60 - light perception
5. No light perception

Pupil
1. Positive - RAPD +
2. Negative – No RAPD

Zone

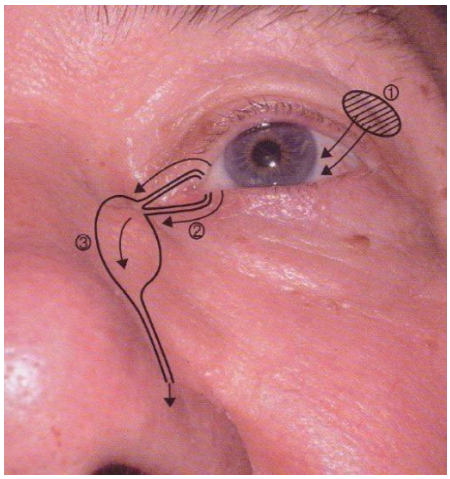


❖ Assessment:

• History
- should be detailed as possible
- time & nature of injury
- Missile, blunt,? FB remaining, chemical etc.
- Past ocular history - VA, lid function
- Immunization history

• Rule out life threatening injuries
• Rule out globe threatening injuries
• Examine both eyes
• Documentation +/- photograph
• Plan for repair

Eyelid trauma



- Precise surgical treatment is necessary.
- Canalicular lacerations should be repaired within 24h.
- Improper management may cause complications:
- improper position of eyelids,
- Defective closure of lids corneal ulcers
- Lacrimal obstruction

• Periocular Hematoma :

- Generally innocuous but it is very important to exclude: -

1. Trauma to the globe or orbit
2. Orbital roof fracture
3. Basal skull fracture

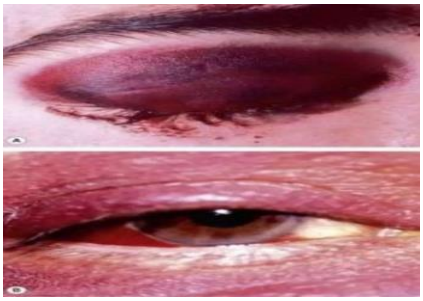


Fig. (A) Periocular haematoma and oedema; (B) periocular haematoma and subconjunctival haemorrhage;

(C) 'panda eyes'

❖ Laceration:

1. Superficial lacerations
2. Lid margin lacerations
3. Lacerations with mild tissue loss
4. Lacerations with extensive tissue loss
5. Canaliculi lacerations

Fig. Lacerated eye injuries

❖ Repair

- **General principles of repair:**

1. Clean the wound
2. Remove foreign body
3. Careful handling of tissues
4. Careful alignment of anatomy

- Lid margins, lash line, skin folds, etc.

5. Close in layers
6. Timing - Ideally within 12-24 hours of injury but can

- delay up to 1 week; pt's factors, gross swelling

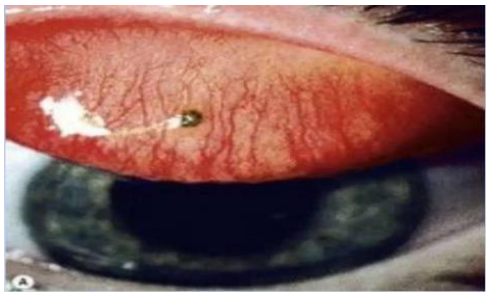
7. Anesthesia

❖ Complications

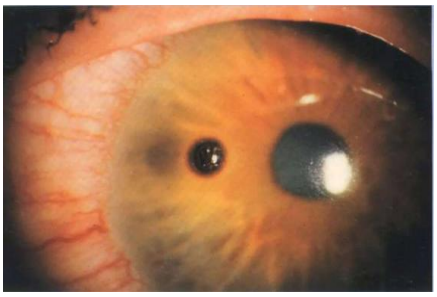
- Lid margin notching, Lagophthalmos, Hypertrophic scar, Infection, failure, Ptosis, Tearing - canaliculi damage, lid malposition and pump .

Foreign body

Superficial foreign body



Superficial foreign body

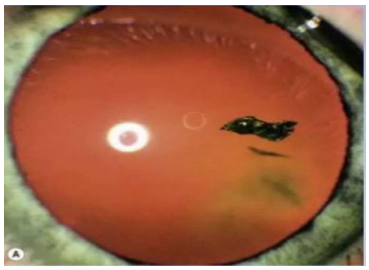


Corneal foreign body with surrounding cellular infiltration

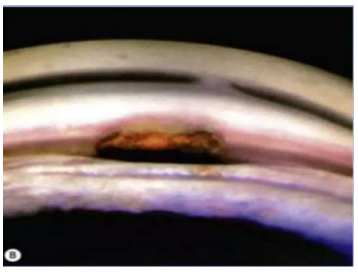
❖ Management:

a. Careful slit-lamp examination for exact position & depth
b. Removal under slit-lamp with 26-gause needle
c. Magnetic removal for a deeply embedded metallic foreign body
d. Residual 'rust ring' may remove with sterile 'burr'
e. Antibiotic oint. with cycloplegic and/or NSAIDs

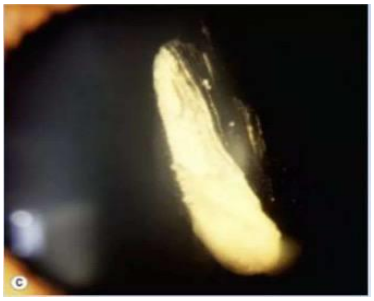
❖ Intraocular foreign body



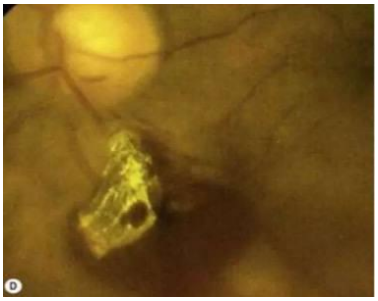
(A) In the lens



(B) In the angle



(C) in the anterior vitreous



(D) on the retina

❖ Management:

a. Accurate history- helpful for nature of FB

b. Examination

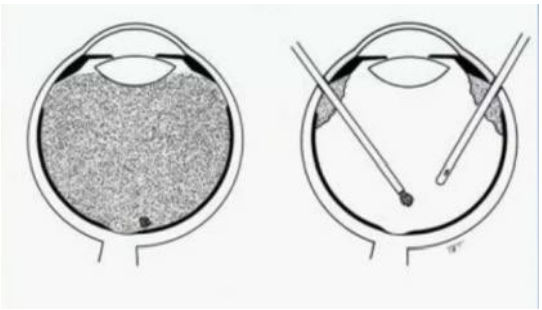
- Entry exit point
- Gonioscopy & fundoscopy must
- Documentation for damaged structure

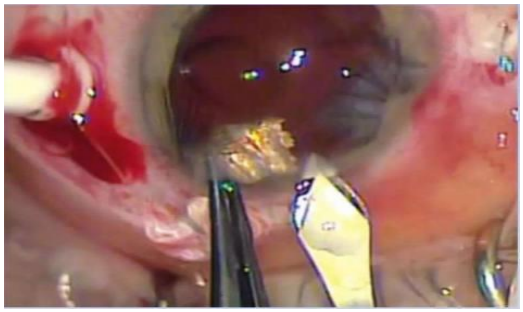
c. CT scan

d. MRI contraindicated for metallic FB

❖ Removal technique

- Removal with magnet or by pars plane vitrectomy
- with forceps either through the pars plane or limbus

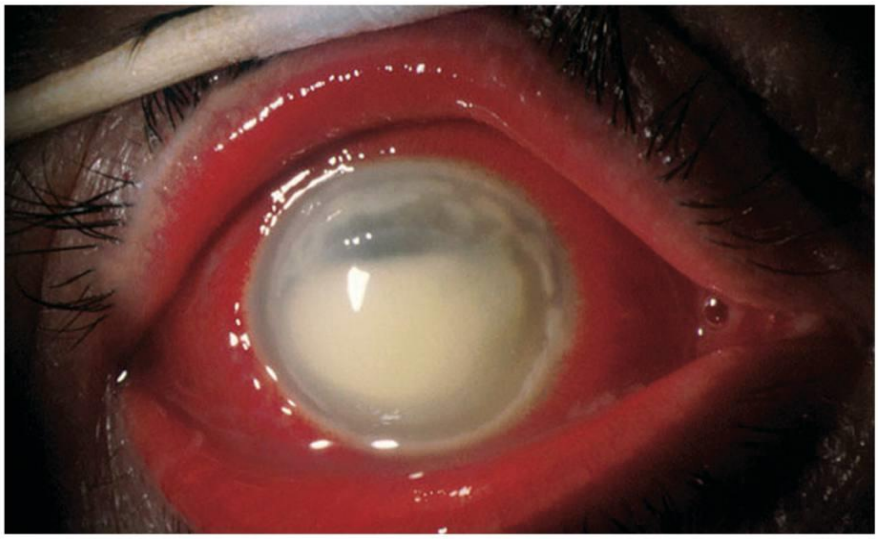




Trauma, chemical injuries

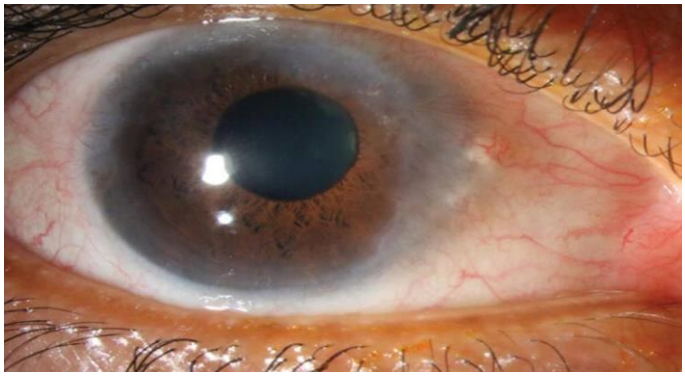
Chemical exposures and burns are usually caused by a splash of liquid but can also be caused by transferring a chemical from your hands to your eyes by rubbing or by being sprayed by aerosols. Treatment should be instituted IMMEDIATELY, even before testing vision, unless an open globe is suspected.

- A corrosive substance is accidentally introduces to the eye and or periocular tissues.
- True ophthalmic emergencies that require immediate and intensive intervention to minimize severe complications and profound visual loss.
- Most prevalent among young males aged 20-40, can result in chronic complications and life-long disability.
- 20% - 30% of all ocular injuries.



➢ **The severity of chemical injury is determined by several factors**

• Chemical and physical characteristics of the offending
• Agent (particularly the pH),
• Specific reactivity with tissues (pK)
• Concentration
• Volume
• Temperature
• Impact force.



➢ Alkali Vs Acid

Alkaline substances: - due to their lipophilicity, penetrate the eye more readily and threaten both ocular surface tissues as well as intraocular structures such as the trabecular meshwork, ciliary body and lens.

Acid substances: - cause protein clotting in the epithelium, a process that limits further penetration into the eye

- **Both alkali and acid can leads to devastating injuries**

➢ Etiology

Common cause of Alkali injuries (60%)

Substance	Chemical Composition	Found in
Ammonia	NH_2	Cleaning agents, fertilizers, refrigerants
Potassium Hydroxide	KOH	Caustic potash
Lye	NaOH	Drain cleaners, airbags Firework sparklers, flares Plaster, mortar, cement, white wash
Magnesium Hydroxide	Mg(OH)2	Found in
Lime	Ca(OH)2	Cleaning agents, fertilizers, refrigerants

Common cause of Acid injuries (40%)

Substance	Chemical Composition	Found in
Sulfuric acid	H_2SO_4	Car batteries
Sulfurous acid	H_2SO_2	Bleach and refrigerant
Hydrofluoric acid	HF	Glass polishing and mineral refining
Acetic Acid	CH_2 COOH	Vinegar, glacial acetic acid
Hydrochloric acid	HCl	Swimming pools

➢ Pathophysiology

Corneal damage by severe chemical injuries occurs in the following order-:

- Necrosis of the conjunctival and corneal epithelium
- Disruption and occlusion of the limbal vasculature
- Loss of limbal stem cells
- Conjuctivilisation and vascularization of the corneal surface
- Persistent corneal epithelial defects with sterile corneal ulceration

➢ Documentation

Documentation must include:

- time of injury
- substance to which the patient has been exposed
- duration of the exposure until the irrigation was started
- pH on arrival (and time of testing(
- duration of the irrigation – how much fluid used
- eyelid eversion
- fornix sweeping
- pH following irrigation (and time of testing.(

- If the pH has not returned to normal, reassure the patient and commence washing again, for at least 20 minutes, document and reassess.

➢ Major chemical injuries

Symptoms of major chemical injuries:

- visual acuity may be affected
- difficulty in getting the pH of the eye back to normal
- limbal ischemia (seen as white, avascular areas at the corneal margins on an eye which is otherwise red)
- avascular areas on eyelid eversion
- severe corneal staining
- hazy cornea.

➢ Minor chemical injuries

Minor injuries, for example perfume and dilute shampoo in the eye, may be treated by an experienced practitioner, provided that:

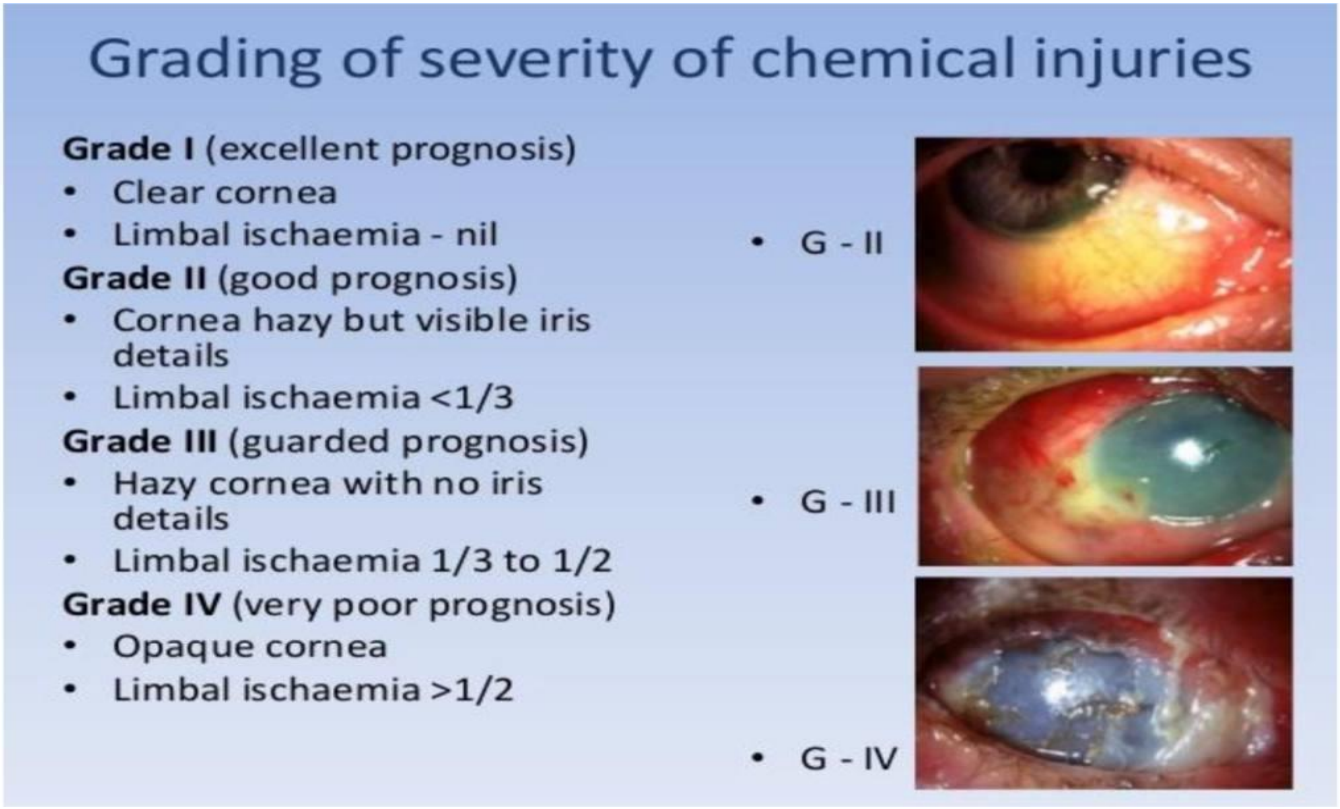
- the pH of the eye is normal
- the vision in the affected eye is satisfactory
- any corneal staining is minimal

● a check has been made under the eyelids for avascular areas
● there is no limbal ischemia.

Eye Emergencies: The practitioner's guide

very effectively washed away, and ointment is a comforting means of providing the antibiotic cover required.

Advise that, although sore at first, the eye symptoms will slowly clear. The patient should telephone for advice immediately if symptoms worsen. By the day after the injury, the patient will be beginning to feel much better.



➢ Treatment

- Copious irrigation using saline or Ringer lactate solution for at least 30 minutes. Tap water can be used in the absence of these solutions. An eyelid speculum and topical anesthesia can be placed prior to irrigation. Upper and lower fornices must be everted and irrigated. Manual use of intravenous tubing connected to an irrigation solution facilitates the irrigation process.
- Conjunctival fornices should be swept with a moistened cotton-tipped applicator or glass rod to remove any sequestered particles of caustic material and necrotic conjunctiva.
- Topical steroid for the first 7-10 days – to reduce inflammation.
- Topical and systemic tetracycline to inhibit collagenase and neutrophil activity