



EYE TRAUMA



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LEARNING OBJECTIVES

- 1- Identify the classification of trauma
- 2- Know the first aid of trauma
- 3- list the clinical features of each trauma type
- 4- Guidline the management of trauma



EYELID TRAUMA



Haematoma (black eye) is the most common result of blunt injury to the eyelid or forehead and is generally innocuous. It is, however, very important to exclude the following more serious condition:

- 1- Trauma to the globe or orbit it is easier to examine the integrity of the globe before the lids become oedematous
- 2- Orbital roof fracture, if the black eye is associated with subconjunctival haemorrhage without visible posterior limit
- 3- Basal skull fracture which may give rise to characteristic bilateral ring haematomas (panda eyes)



LACERATION



- 1- laceration without tissue loss : primary closure
- 2-laceration with tissue loss : just sufficient to prevent direct primary closure can usually be managed by performing a lateral cantholysis in order to increase lateral eyelid mobility
- 3- laceration with extensive tissue loss may require major reconstructive procedures such as used following lid resection for malignant tumors
- 4- canalicular laceration should be repaired within 24 hours
 - A- the laceration is bridged by silicon tubing which is threaded down the lacrimal system and tied in the nose
 - B- the laceration is sutured
 - C- the tubing is left in situ for 3-6 months



ORBITAL FRACTURE TREATMENT

All orbital fractures

- ❑ Advise patients to refrain from nose blowing , which may contribute to surgical emphysema and herniation.
- ❑ Consider antibiotic prophylaxis : commonly anaerobic cover is prescribed (e.g co-amoxiclav) but limited advice for any benefit.
- ❑ refer to orbital or maxillofacial team for consideration of surgical repair.
- ❑ Arrange orthoptic follow- up to monitor recovery / postoperative course.



FRACTURES OF THE ORBITAL FLOOR

Indications for surgical intervention in orbital floor fractures

Immediate

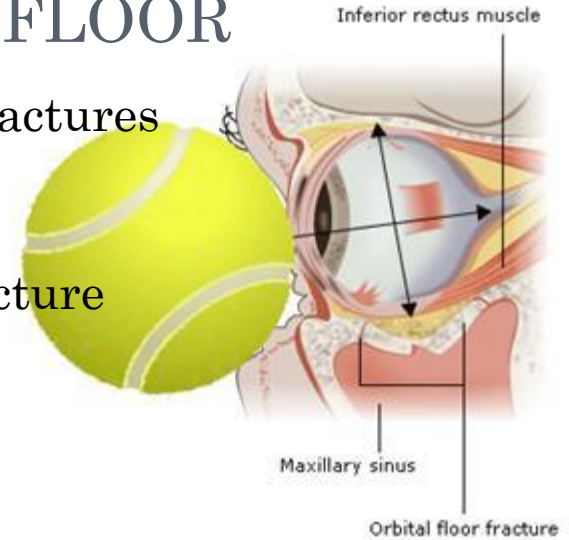
- ❑ persistent oculocardiac reflex
- ❑ Young patient with “white eyed” trap-door fracture (orbital floor buckling occurring in children)
- ❑ significant facial asymmetry

Early < 2wks

- ❑ Persistent symptomatic diplopia
- ❑ Significant enophthalmos
- ❑ hypoglobus
- ❑ progressive infraorbital hyposthesia

Observation

- ❑ Minimal diplopia (e.g just in upgaze)
- ❑ Minimal restriction
- ❑ Minimal enophthalmos



SURGICAL REPAIR OF ORBITAL FLOOR FRACTURE

- subciliary or transconjunctival incision to expose the inferior orbital rim.
- incision the periosteum 2mm outside the orbital rim.
- carefully release all herniated orbital contents taking care to separate from infraorbital nerve and vessels.
- continue until the whole fracture has been exposed.
- repair bony defect with an implant (e.g teflon, supramyd) with an overlap of $\geq 5\text{mm}$, which should be fixed in position.
- close periosteum with absorbable suture (e.g 4-0 vicryl).
- Close subciliary /transconjunctival incision.



ORBITAL FRACTURES

HX mechanism of injury

Diplopia, area of numbness ,epistaxis , visual symptoms (associated ocular injury)

O/E pain ,periorbital bruising /oedema/haemorrhage ,surgical emphysema , globe position ,globe pulsation ,ocular motility ,subconjunctival haemorrhage, discontinuity of orbital rim

Any associated ocular injury

Any potential cervical or head injury (refer to trauma team) collapse may be due to oculocardiac reflex secondary to EOM entrapment

IX facial x-rays, droplet sign (soft tissue prolapse in orbital floor fracture) fluid level in maxillary sinus ; visible fracture.

CT(2mm coronal slices): identify fractures (bony windows) , prolapsed orbital fat / extraocular muscles and haemorrhage.

Hess / leas and field of binocular vision tests show characteristic mechanical restrictive patterns and allow monitoring of recovery



Orbital floor (maxillary bone)

This is the commonest orbital fracture . It usually follow the blow from an object more than 5 cm (e.g tennis ball/fist) . The force may be transmitted by hydraulic compression of globe / orbital structures (blow out) or may be directly transmitted along the orbital rim

Soft tissue: periorbital bruising/odema/haemorrhage, surgical emphysema.

Vertical diplopia due to mechanical restriction of upgaze. This may be secondary to tissue entrapment following prolapse through the bony defect (persistent) or soft tissue swelling tenting the extraocular muscle insertion (transient)

Enophthalmos.

Infraorbital anesthesia due to nerve damage in infraorbital canal .



Medial wall (ethmoidal)

Medial wall fractures are rare as an isolated feature but they may be accompany orbital floor fracture .

Soft tissue signs as as for orbital floor fractures but surgical emphysema may be prominent

Horizontal diplopia due to mechanical restriction from medial rectus entrapment.

Orbital roof (frontal)

Very rare as an isolated fracture . They are most commonly seen in children following brow trauma soft tissue sign as for orbital floor fractures but bruising may spread across midline.

superior subconjunctival haemorrhage with no distinct posterior limit

Inferior /axial globe displacement

bruit/pulsation due to communication with csf ... carry risk of meningitis

Lateral wall (zygomatic arch)

act as protective shield to the globe



BLUNT TRAUMA : ASSESSMENT

Hx

mechanism , associated injuries

O/E

Globe : look for anterior or posterior rupture.

Cornea: check fluorescein staining , clarity.

AC: check for cells/flare , and depth (compare with other eye).

Iris /ciliary body : note abnormalities of the pupil and examine iris root / angle by gonioscopy.

Lens : opacity , position ,stability.

Vitreous: PVD, haemorrhage.

Fundus: note commotio retina(usually temporal ; check macular pathology (e.g hole) ; examine equator/perphery for retinal tears/ dialysis ,consider choroidal rupture (often masked by blood).

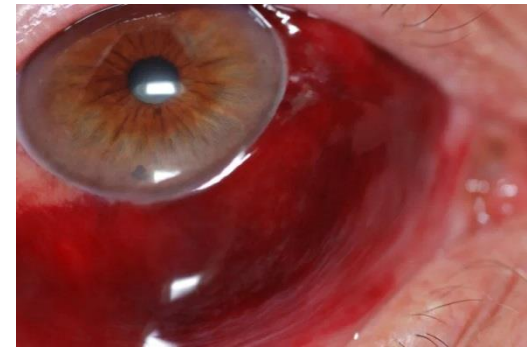
Optic nerve: check function and disc appearance.

IOP.

beware occult posterior rupture , check for associated orbital /adenxial injuries

IX

Consider orbital facial x-ray , B scan , US , CT orbits/ brain (assess the extent of damage _ particularly where clinical assessment limited)



CLINICAL FEATURES

Globe

Anterior rupture : usually obvious with herniation of uveal tissue , lens and vitreous , and other signs of injury (e.g sever subconjunctival haemorrhage , hyphaema , etc).

Posterior rupture: suspected if deep AC +/- low IOP compare with contralateral eye).

Anterior segment

- ❑ Corneal abrasion /corneal odema
- ❑ Hyphaema : red blood cell in the anterior chamber
- ❑ Iris : miosis (usually transient) ,mydriasis (often permanent) , and sphincter rupture (irregular pupil ; permanent), iridodialysis (dehiscence from ciliary body) and angle recession.
- ❑ Lens: vossius ring (imprint of iris pigment on anterior capsule) ,cataract (anterior or posterior subcapsular),subluxation / luxation of the lens.



Posterior segment

Vitreous : posterior vitreous detachment , vitreous haemorrhage.

Commotio retinae: grey –white retinal opaqueness as a result of fragmentation of photoreceptor outer segments and intracellular odema (photoreceptors and pigment epithelium) ; with increasing severity intraretinal haemorrhages.

--in most cases commotio retinae completely resolves , but in minority macular hole / pigmentary changes ensues.

--in extreme cases , such as where a projectile has grazed but not penetrated globe ,haemorrhagic necrosis of the choroid and retina may occur .

--retinal dialysis : full thickness circumferential break at the ora serrata ; commonly superonasally (when traumatic)

-- macular hole : acute or late

--choroidal rupture

--traumatic optic neuropathy: acutely decrease optic optic nerve function (including RAPD) in presence of normal disc appearance; later disc pallor .

-- optic nerve avulsion



BLUNT TRAUMA TREATMENT

--primary repair of globe rupture

---secondary repair

- ❑ Iris injuries involving the iris.
- ❑ Lens injuries (other than herniation through a ruptured globe) don't require surgical intervention.
- ❑ increase IOP (lens related glaucoma) or inflammation (breach capsule) warrant removal of the lens ; some cases may require avitreoretinal approach.
- ❑ Vitreoretinal :retinal tears or retinal dialysis require urgent referral for vitreoretinal assessment and repair; macular holes should also be referred but generally be seen electively.
- ❑ Commotio retina no treatment usually indicated .



CHEMICAL INJURY

For chemical injuries , treat first , ask questions later

Chemical injuries are among the most destructive of all traumatic insults suffered by the eye. They may occur in domestic , industrial, and military settings. Alkalis cause liquefactive necrosis and thus penetrate the eye to a greater extent than acids , which cause coagulative necrosis and so impede their own progress.

Prognostic factors

The severity of a chemical corneal injury is determined by the following:

- PH : alkaline agents generally cause more severe injuries than acids . although very acidic solutions may behave similarly ; most domestic chemical agents are alkaline(or neutral) rather than acidic.
- Duration of contact.
- corneal involvement: surface area ,duration of contact.
- limbal involvement corneal re-epithelialization relies on migration of the limbal stem cells.
- conjunctival involvement : blind ended sacs that may retain chemical and cause continuing ocular damage.
- associated non – chemical injury: blunt trauma ,thermal injury.



Grading of severity of chemical injuries

Grade I (excellent prognosis)

- Clear cornea
- Limbal ischaemia - nil

Grade II (good prognosis)

- Cornea hazy but visible iris details
- Limbal ischaemia $<1/3$

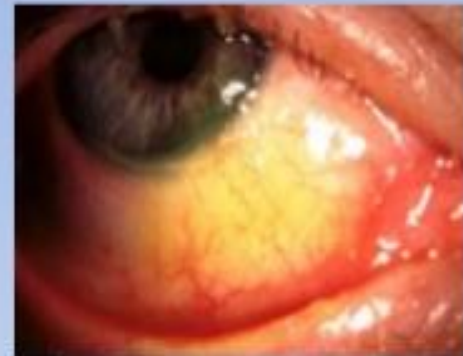
Grade III (guarded prognosis)

- Hazy cornea with no iris details
- Limbal ischaemia $1/3$ to $1/2$

Grade IV (very poor prognosis)

- Opaque cornea
- Limbal ischaemia $>1/2$

• G - II



• G - III



• G - IV



Clinical feature

-- conjunctival injection or ischemia (beware the white eye) , chemosis , haemorrhage , epithelial defects , ulceration , necrosis , or complete loss of conjunctiva; necrosis or complete loss of conjunctiva ; perilimbal ischemia/ limbitis (blanched vessels with no visible blood flow); corneal epitheliopathy (punctate to complete loss) ;corneal oedema;corneal stromal necrosis, AC activity and fibrin; traumatic mydriasis, increase IOP measured by tonopen ; rarely scleral necrosis , vitritis , necrotic neuropathy.

Complication

-- conjunctival burns , cicatrization (scarring) , symblepharon formation ,loss of goblet cells, keratinization.

--significant limbal ischemia conjunctivalization , vascularization , and opacification cornea.

---full thickness burns: scleritis , vitritis , reinitis , glaucomatous optic neuropathy or hypotony .

--- periorbital burns.



Treatment

Immediate

-- neutralization of PH by irrigation before full history and examination .

This is probably the most important determinant of the outcome .

Test PH, then instill topical anaesthesia , insertion of speculum and irrigate with water or normal saline through IV tubing and deliver a minimum of 2 litres or until normal PH is restored . Delay to obtain irrigants other than water is not warranted .

Inspection

Evert the lids (double evert the upper lid) and inspect the fornices. Remove the retained particulate matter that may perpetuate alkalinity (e.g lime ,cement).



Indicator test

Test PH at the end of irrigation and 5 min after completion of irrigation .

--if PH neutral (normal tears may be slightly alkaline) , then you may begin examination and initiate further treatment . However recheck PH after 20 min.

--if PH abnormal , then repeat irrigation cycle (with another 2 liters) until PH normal

-- PH should be recorded on daily basis until ocular surface is healed (to exclude release of chemical from inherent forniceal particles of chemical).

Acute : all injuries

--Admit if severe or any other concerns.

--Topical antibiotic prophylaxis(preservative free chlorph. *4/d)

-- topical cycloplegia for comfort / AC activity (atropin 1% *1/d)

-- topical lubricants

--Oral analgesia (e.g paracetamol , codeine)

Acute : severe injuries

-- admission

--topical steroid (prednisolone 1% initially *8/d for less than 10 days

-- topical ascorbic acid (sodium ascorbate 10% up to 2 hourly for less than 10 days -- oral ascorbic acid (e.g 1 g *2 /daily) . Collagen formation

-- systemic tetracycline (100 mg /d) .proteinase inhibitor to prevent tissue necrosis and facilitate healing

Acute : injuries with increase IOP

Acetazolamide 250mg *4 /d with topical betablocker



Long term complication

- poor corneal healing
- Obliterated fornices and pseudopterygium formation .
- corneal opacification



Hyphaema

Blood in the anterior chamber is most commonly seen in the context of blunt trauma . It ranges from mild microhyphaema to a total 8 ball hyphaema

causes

- Trauma: blunt or penetrating
- Surgery: trabeculectomy , iris manipulation
- spontaneous : iris /angle neovascularization, tumor , IOL erosion iris .

Clinical features

- RBC in the anterior chamber
- complications : rebleeds , corneal staining especially (especially if increase IOP) , red cell glaucoma.

Treatment

- admit high risk cases
- strict bed rest and globe protection
- avoid aspirin , NSAIDS, warfarin
- topical steroid and cycloplegia
- if increase IOP use topical b blocker

















