OPHTHALMIC INJURIES

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Content Attestation

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**EYELID TRAUMA**

- Contusions
- Lacerations
- Burns

**EYELID CONTUSIONS**

- Caused by blunt force trauma
- Periocular swelling and ecchymosis may make it difficult to examine the eye, but the examiner must be sure there is no globe trauma
- Treat patient with ice compresses and elevation of the head

**EYELID CONTUSION**

Check the vision in all trauma cases
Check the extraocular movements
In this case the CT scan shows preseptal swelling but the orbit is otherwise OK
EYELID LACERATIONS

- Full thickness lid lacerations can occur from blunt or sharp trauma
- DON’T FORGET TO CHECK THE EYEBALL!!

TRANSMARGINAL EYELID LACERATION

- Check the integrity of the lacrimal system
- In this case the entire lid margin is cut
- Any laceration affecting the medial canthus should have a probe and irrigation of the punctum and canaliculus

TRANSMARGINAL EYELID LACERATION

- A different patient showing a punctal probe in the punctum and exiting through the lacerated canaliculus
FOLLOWING REPAIR OF LID LACERATION WITH SILICONE INTUBATION OF THE LACRIMAL SYSTEM

- Eyelid contour has been restored
- Note presence of the silicone tube stent in left medial canthus

Following removal of stent 3 months later

EYELID BURNS

- May be thermal, chemical or electrical
- Cornea and conjunctiva are commonly affected
- The blue area on the inferior cornea is from thermal damage to the epithelium
CONJUNCTIVAL INJURIES

- Subconjunctival hemorrhage
- Chemical exposure
- Foreign body
- Conjunctival abrasions/lacerations

SUBCONJUNCTIVAL HEMORRHAGE

- May be flat or elevated
- Valsalva can cause these
- Treatment is cool compresses, artificial tears and reassurance
- If there is a history of significant direct trauma to the eye, be sure there is no underlying scleral trauma. Clues to this would be vision loss or pupil asymmetry.

CHEMICAL EXPOSURE

- In general high pH causes more serious injury than low pH
- Blanching of vessels is a poor prognostic sign (a sign of ischemic damage to the anterior segment)
- Treat acutely with copious irrigation
CONJUNCTIVAL FOREIGN BODY

- Lesions on the bulbar conjunctiva are usually apparent
- Treatment is removal (with a Q-tip, jewelers forceps or a sterile needle) and topical antibiotics

CONJUNCTIVAL FOREIGN BODY

A foreign body attached to the tarsal conjunctiva may not be easy to see. Be sure to flip the upper eyelid, especially if the patient complains of irritation with blinking.

A tipoff that you may be dealing with a foreign body on the tarsal conjunctiva is that you will see vertically oriented linear corneal abrasions which stain with fluorescein

Treatment is removal and topical antibiotics

CONJUNCTIVAL ABRASION/LACERATION

- Conjunctival abrasions stain with fluorescein the same way a corneal abrasion would
- Conjunctival lacerations must be carefully inspected to be sure the underlying sclera is not involved. Beware if there is an irregular pupil or significant visual loss
- Treat with topical antibiotics
CORNEAL INJURIES

- Abrasions
- Foreign bodies
- Chemical exposure
- Lacerations

CORNEAL ABRASIONS

- Common, quite painful
- Stain with fluorescein
- Treat patient with antibiotic eyedrops, patching or a bandage contact lens
- OK to give a 1-2 day supply of oral pain meds. NEVER dispense a topical anesthetic for pain relief!

CORNEAL FOREIGN BODY

- These injuries are commonly associated with grinding or pounding metal
- Remove with a Q-tip or sterile needle. Use a slit lamp!!
- An Alger brush (a spinning burr) works best for rust rings
- Treat with antibiotic eyedrops. Patching not usually needed or recommended. A topical non-steroidal can give some pain relief
CHEMICAL EXPOSURE

- Very important to find out the name and pH of the chemical exposure
- In this case the corneal and conjunctival epithelial defects stain with fluorescein
- Bases are more destructive than acids because they penetrate into the deep cornea and anterior chamber.

INITIAL TREATMENT: irrigate, irrigate and irrigate some more
LONG TERM TREATMENT: lengthy and complex

CORNEAL LACERATIONS

- Can be from blunt or sharp trauma
- Beware: An irregular pupil!! This often indicates that iris tissue is plugging the corneal wound
- Treatment is a surgical emergency
CORNEAL LACERATIONS

- Also beware of massive chemosis (i.e., edema of the conjunctiva)
- Routine subconjunctival hemorrhages don’t usually “balloon” out like this
- A white cataract is also an ominous sign

CORNEAL LACERATIONS

That is NOT a clot of blood sitting on the surface of the cornea. It is extruding intraocular contents. Do not attempt to remove this tissue with a Q-tip or other instrument!

SCLERAL LACERATIONS

- Similar to corneal lacerations, but can be more insidious, as in the picture to the right (note the irregular pupil)
- Common “weak points” in the sclera include the limbus, previous cataract surgical incisions and behind the muscle insertions
- Always beware if there is brown tissue present as it probably represents extruding uveal tissue
- May need to do a surgical globe exploration in uncertain cases
**INTRAOCULAR TRAUMA**

- Anterior chamber
- Lens
- Vitreous
- Retina

**ANTERIOR CHAMBER**

- Iritis
- Hyphema
- Foreign body

**TRAUMATIC IRRITIS**

- Very common following blunt force trauma to the eye.
- Symptoms include photophobia, pain and blurred vision.
- Diagnosed with a slit lamp examination (by an experienced observer).
- WBC's are seen floating in the anterior chamber.
- Treatment is cycloplegia and topical steroids.
**TRAUMATIC HYTHEMA**
- Common following blunt force trauma
- Look for the characteristic layering of the blood in the inferior anterior chamber
- Treatment is strict bedrest for 5 days with head elevation, cycloplegia, topical and oral steroids
- Glaucoma can occur. Rebleeds are common during the first 5 days. Complications are more common in patients with sickle cell.

**ANTERIOR CHAMBER FOREIGN BODY**
- CT imaging can be helpful for metallic foreign bodies
- Never do an MRI if there is even a remote chance of a metallic foreign body
- Look for an entry wound in the cornea as a clue that there could be an intraocular foreign body
- The entry wounds may be self-sealing
- Treatment is surgical removal and antibiotics

**LENSES/IRIS TRAUMA**
- Intra-lenticular foreign body
- Cataract
- Subluxation
INTRA-LENTICULAR FOREIGN BODY

- Associated with an entry wound and traumatic iritis/hyphema
- Usually leads to rapid development of a cataract
- Treatment is removal of the foreign body and the lens

TRAUMATIC CATARACT

- Commonly seen with penetrating trauma which violates the anterior lens capsule. In these cases the cataract typically develops rapidly.
- When a traumatic cataract is associated with blunt trauma the cataract is usually slower to develop.
- Often associated with dehiscence of the lens zonules which can complicate surgical removal

TRAUMATIC CATARACT

- May be stellate or sectoral
- Often associated with iris trauma and zonule loss which causes subluxation
VITREOUS TRAUMA

- Hemorrhage
- Foreign body

VITREOUS HEMORRHAGE

- From blunt or penetrating trauma
- Can also occur following crush injuries to the chest
- Patient complains of floaters, “cobwebs” and blurred vision

Ultrasoneography is useful when the vitreous hemorrhage is dense enough to prevent direct visualization of the retina.
INTRA-VITREAL FOREIGN BODY

- CT imaging can be very helpful, especially if a traumatic cataract or vitreous hemorrhage obscures the view
- May be removed with vitreous surgical instruments and intraocular magnets

RETINAL TRAUMA

- Hemorrhage
- Foreign body
- Laser burn
- Retinal tear or detachment

TRAUMATIC RETINAL HEMORRHAGE

- Common with blunt trauma
- Symptoms may be minimal unless the central macula is involved
INTRA-RETINAL FOREIGN BODY

- Never do an MRI on a case with suspected intraocular foreign body.
- Examination is often limited by concomitant traumatic cataract or vitreous hemorrhage.

RETINAL LASER BURN

- Case of a dermatologist who sustained a YAG laser burn to the fovea during a procedure to remove an unwanted tattoo from a patient.
- Fluorescein angiogram shows abnormal staining of the central macula.

TRAUMATIC RETINAL TEAR/DETACHMENT

- Symptoms include floaters, flashing lights and a curtain or shadow sensation affecting the peripheral vision. May progress into the central vision.
- Head trauma is not a common cause for a retinal detachment.
- Direct trauma to the eye may cause a retinal detachment.
ORBITAL TRAUMA

- Hemorrhage
- Foreign body
- Fractures

ORBITAL HEMMORHAGE

- The eye is often proptotic
- The extraocular movements are restricted
- Orbital imaging is very helpful
- This case shows a subperiosteal hematoma along the orbital roof with inferior displacement of the globe

ORBITAL FOREIGN BODY

- A BB gun injury to the right lower eyelid
- Note the subconjunctival hemorrhage and ecchymosis of the lower lid
ORBITAL FOREIGN BODY
- A plain film clearly shows the foreign body.
- A CT scan helps to define the relationship of the foreign body to the globe and eye muscles. This helps with surgical planning.

ORBITAL FOREIGN BODY
- This patient was hammering metal when he felt something strike his right eye.
- The CT shows a metallic foreign body in the orbit.

ORBITAL FOREIGN BODY
- Closer examination of the eye, along with the information obtained from the CT, indicates a "double perforating" injury. The foreign body entered through the front of the globe and went out the back, coming to rest in the orbit. Note the massive chemosis, irregualar pupil and white cataract, all indicators of "something bad.
- Bone windows on the CT show the foreign body nicely.
ORBITAL FRACTURE-FLOOR

32 yo male with diplopia following blunt trauma
Note the restricted upgaze of the left eye

ORBITAL FLOOR (BLOWOUT) FRACTURE

- The left inferior rectus is entrapped in the fractured orbital floor
- The medial wall is also fractured but the medial rectus was not affected

FOLLOWING FRACTURE REPAIR WITH RESOLUTION OF DIPLOPIA

Note the improved upgaze on the left
ORBITAL FRACTURE-MEDIAL WALL

This patient's symptoms included diplopia on left gaze. Examination showed inability to abduct the eye.

The medial rectus is entrapped in the fractured medial wall/ethmoids.

ORBITAL FRACTURE-ROOF

48 yo male with blunt trauma OS and diplopia.

Similar to the patient with the floor fracture, there is diminished upgaze, but for a different reason.

Also note the ptosis.
ORBITAL FRACTURE-ROOF

- The CT shows a bone fragment which is restricting upgaze by "skewering" the superior rectus. It also is inducing ptosis by impinging on the eyelid levator muscle.
- Retinal exam shows indentation of the inside of the globe.

ORBITAL FRACTURE-ROOF

- Upgaze is restored following surgical repair.

NEURO-OPHTHALMIC TRAUMA

- 3rd CN palsy
- 4th CN palsy
- 6th CN palsy
- Traumatic optic neuropathy
- Pupil abnormalities
- Visual field defects
3rd CN Palsy
Common following head injuries
Note the ptosis with limitation of abduction, elevation and depression of the globe

4th CN Palsy
Also occurs following head injury
- The eye movement abnormalities of a 4th CN palsy are more subtle than a 3rd or 6th CN palsy
- The affected eye is deviated upwards, most noticeable on gaze to the opposite side

6th CN Palsy
35 yo male with history of head injury
The patient is looking straight ahead
Do we all agree the patient has a left 6th CN palsy??
The answer is:

NO!

We need more information!

6\textsuperscript{th} CN Palsy

We need to check the extraocular movements first

\begin{itemize}
  \item R Gaze
  \item Straight ahead
  \item L Gaze
\end{itemize}

This is a right 6\textsuperscript{th} CN palsy. In the image on the left, the patient is “fixing” with his right eye. When we have him look left and right the correct diagnosis is apparent.

Workup of traumatic 3\textsuperscript{rd}, 4\textsuperscript{th} or 6\textsuperscript{th} CN palseys

\begin{itemize}
  \item A brain MRI is indicated in the acute setting
  \item 3\textsuperscript{rd}, 4\textsuperscript{th} and 6\textsuperscript{th} CN palseys are commonly (but not always) associated with other neurologic deficits
\end{itemize}
Treatment of diplopia

- In the acute setting, patch the non-dominant eye (i.e., the eye they are not looking at you with)
- Prisms can be useful for intermediate/long term treatment of symptoms
- Eye muscle surgery is useful, but best deferred for a minimum of 6 months after the onset to allow for spontaneous healing

Treatment: Occlusion

- Occlusion

Treatment: Prisms

- Prisms can be used for horizontal, vertical, or oblique strabismus
- The amplitude and angle of the strabismus is measured in the exam room
- The glasses are marked
- The Fresnel prism is applied by an optician
TREATMENT: Right eye strabismus surgery

Preop

1 Day following eye muscle surgery

TRAUTOMATIC OPTIC NEUROPATHY

- Patient will complain of visual loss
- Can occur after blunt trauma to the periorbital area
- Hallmark is an afferent pupillary defect, seen below. Note: there is no anisocoria!

NEURO-OPHTHALMIC TRAUMA

- 23 yo male noticed drooping of the left upper lid after heavy lifting.
Closer inspection reveals the pupils are also asymmetric

- Pupils with the room lights on
- Pupils with the room lights off

PUPIL ABNORMALITIES

- After placement of 10% cocaine eyedrops in both eyes the failure of the left pupil to dilate confirms a left Horner’s syndrome

Horner’s Syndrome

- Can occur following trauma.
- Always consider a carotid artery dissection as a possible cause.
- Imaging should include the upper chest, neck and head
Horner’s Syndrome

- In this case the patient was diagnosed as having a thrombosis of the left subclavian. A thrombectomy was performed.

Pupil Abnormalities

- This patient accidentally splashed insecticide in her right eye. She complains of blurred vision.

Pupil Abnormalities

The insecticide contained diethylphosphorothioate, an organophosphate which irreversibly inactivates acetylcholinesterase. The resulting cholinergic effect causes pupillary miosis (constriction).

- R pupil 1.5 mm/nonreactive
- L pupil 3.0 mm/reactive
Neuro-Ophthalmic Trauma: Visual Field Defects

- Test the visual fields by having the patient cover one eye, look at your nose, and ask them to count the number of fingers presented peripherally in each of the 4 quadrants of the eye.
- Then test the other eye.

A visual defect in one eye is caused by trauma to the pre-chiasmal pathways.

A bitemporal hemianopsia is caused by trauma to the chiasm.
Neuro-Ophthalmic Trauma: Visual Field Defects

A homonymous hemianopia is caused by trauma to the retrochiasmal pathways.

Traumatic visual field defects need to be worked up with neuro-imaging.

This has been an overview of ophthalmic injuries (for the non-ophthalmologist)

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Thank you!