

TRAUMATIC EYEMERGENCIES

Marcus Gonzales, OD, FAAO

FINANCIAL DISCLOSURES

- No financial disclosures.
- Marcus Gonzales OD, FAAO
- Clinical Associate Professor at the University of Houston College of Optometry
- Clinic Director at the Cedar Springs Eye Clinic in Dallas, TX

OBJECTIVES/GOALS



- Review the ways ocular trauma can affect the eye
- Learn how to diagnosis and manage the complications associated with ocular trauma
- Learn emergent and urgent surgical options

OCULAR TRAUMA

- ~2.4 million traumatic eye injuries occur/year
- 75% all trauma occur in men
- Most often in 15-20 yos
- Mostly related to outdoor activities
- ~15% work-related
- 70% Closed Globe
- Over 70% VA>20/40



Crumpton KL. Ocular Trauma: A Quick, Illustrated Guide to Treatment, Triage, and Medicolegal Implications. Emerg Med J; Nov. 1997.
Pandita A, Merriman M. Ocular trauma epidemiology: 10-year retrospective study. NZ Med J. 2012 Jan 20;125(1348):64-9. PMID: 22282278.

YOU'RE A DOCTOR...YOU GOT THIS!

- It is the responsibility of the initial eye care provider to identify serious ocular conditions and to initiate appropriate care and/or referral
- The care rendered frequently determines that patient's ultimate visual outcome
- What you do and how you handle the situation may save the patient's sight or life

MEDICAL AND LEGAL ISSUES

- Trauma accounts for ~3-4% of all ophthalmological malpractice lawsuits
- Malpractice lawsuits require negligence that resulted in damage/injury
- When patients feel they have been harmed, neglected or deliberately lied to, they sue
- People don't sue whom they like...so listen, show empathy and follow up

Chou, Brian. Protect Yourself from Medicolegal Risk. Rev Optom; March 2002.
Enzelhard, Stephanie B et al. "Malpractice Litigation in Ophthalmic Trauma." Clinical ophthalmology (Auckland, N.Z.) vol. 14 1039-1046. 12 Jul. 2020.

WAYS TO PREVENT NEGLIGENCE

- Train staff to triage well
- Be likeable and communicate well
- Document compulsively
- Treat/refer patients in a timely manner
- Explain potential risks & long-term sequelae
- Follow up with patient
- Don't criticize other health professionals

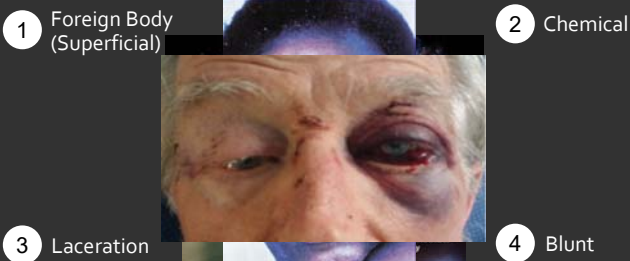
Raju KV. Medico Legal Aspects of Ocular Trauma. Kerala J Ophthalmol, Vol. XXII, No. 3, Sept. 2010. 278.
Crompton RL. Ocular Trauma: A Quick, Illustrated Guide to Treatment, Triage, and Medical/Legal Implications. Emerg Med J Nov 2002

PHONE/TELEHEALTH TRIAGE

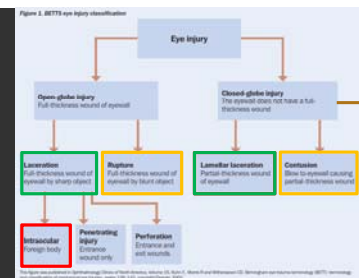
- Vision Loss
- Pain/Redness
- Trauma
- Patient thinks an emergency*
- Consider having patient use shield



OCULAR INJURIES



OPEN VS CLOSED GLOBE INJURY

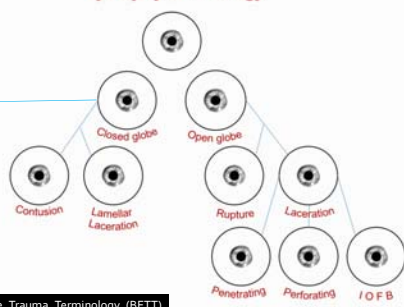


Birmingham Eye Trauma Terminology System (BETTS)

Eye Injury Terminology



Chemical Burn



[https://eyewiki.aao.org/Birmingham_Eye_Trauma_Terminology_\(BETT\)](https://eyewiki.aao.org/Birmingham_Eye_Trauma_Terminology_(BETT))

EVALUATION – TRIAGE

Open Globe:

- Quick history & evaluation
- Provide first aid
- Send to ER/Surgery Center

Closed Globe:

- Full history & evaluation
- Manage what you can
- Refer to appropriate subspecialty in timely manner

EVALUATION

- Stabilize the patient, then stabilize the eye
- Will have to do things that patient will not like/uncomfortable
- Full evaluation may need general anesthesia at ER/Surgery Center
- Don't do testing that could worsen the situation
 - ie - Applanation tonometry with perforated cornea
- More intraocular damage = less intraorbital or orbital damage and vice versa

SYSTEMATIC EVALUATION

- General Medical Observation:
 - Cranio-Orbital shape
 - Adnexal/Conjunctival bruising/bleeding
 - Globe shape
 - Globe position in orbit (proptosis, enophthalmos, hypoglobus)
 - Foreign objects
 - Systemic findings (smell, hearing, facial mvmt/sensation)

SYSTEMATIC EVALUATION

- BCVA and APD testing are crucial for:
 - Diagnosis
 - Management
 - Prognosis
 - Medicolegal
 - Comparison at follow-ups
- Can use topical anesthetic, but in general avoid until after assessment
 - If unable, document reason

SYSTEMATIC EVALUATION

- Confrontation Fields – restrictions
 - Retinal detachments or neurological damage
- IOP – elevated or asymmetric
 - Angle recession or hyphema
- EOMs – diplopia, limited range or pain during eye movement
 - EOM entrapment or orbital compartment syndrome
- Don't forget the posterior segment
 - May need B-scan to evaluate

ASSESSMENT/PLAN

- Treat & Monitor
 - Double-check allergies before treatment
 - Don't initiate treatment that will affect cultures
- Refer to APPROPRIATE provider
 - Specify timeline
- Follow up!



SUPERFICIAL FOREIGN BODY



Closed-globe injury
The eyewall does not have a full-thickness wound

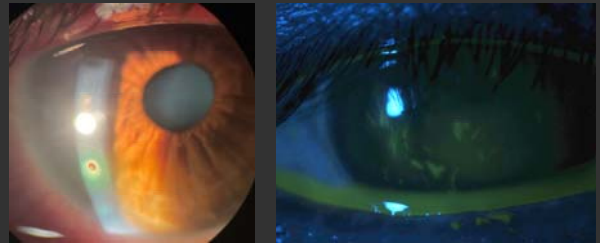
Lamellar laceration
Partial-thickness wound of eyewall

Contusion
Blow to eyewall causing partial-thickness wound

HISTORY – FOREIGN BODY

- Onset (date/time if possible)
- Type of material (occur at work)
- Relieving factors
- Photophobia
- Pain on blink or eye movement

CORNEA



CONJUNCTIVA

- Check all quadrants!



<https://webeye.ophth.uiowa.edu/eforum/pat/as/pages/Foreign-Body-Subconj/index.htm>
<https://www.reviewededucationgroup.com/case-be-an-ocular-foreign-body-flier>

UNDER LIDS & FORNIX

- Evert (double evert)
- Sweep the upper/lower cul-de-sac



<https://www.reviewededucationgroup.com/case-be-an-ocular-foreign-body-flier>

PREP THE OR

- Minor surgical preparation
- Eye spears/sponges
- Forceps, spud, syringe tip
- Bandage contact lens
- Alger brush and/or diamond burr
- In-office eye drops: IOP-lowering, antibiotic
- Amniotic membrane



PREP THE OR

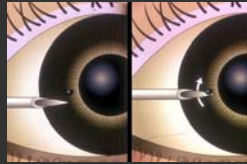
- SLE diffuser lens (if possible)
- Hold instruments like a pencil & perpendicular to cornea
- Visualize outside SLE first



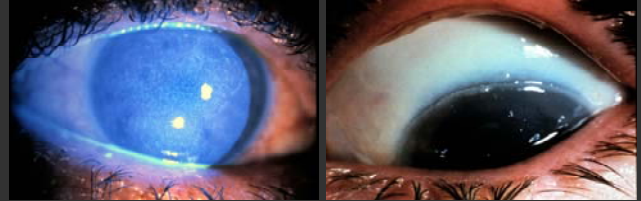
FOREIGN BODY REMOVAL

- Remove with instrument, forceps, sterile sponge, needle, etc
- Remove rust ring if present (alger brush)
- Create smooth edges for corneal healing (diamond burr)
- Conjunctiva grows back quickly

- Prophylactic antibiotic
- Bandage contact lens
- Steroids?



CHEMICAL BURNS



HISTORY – CHEMICAL BURN

- Onset (date/time if possible)
- Situation at time of injury (occur at work)
- Type of chemical?
- Product packaging information?
- Contact lens wearer?
- Flushed eye yet? How long and with what?

CHEMICAL BURN

- Prognosis dependent on:
 - Toxicity of chemical
 - How long it was on the eye
 - Amount area involved
 - Depth of penetration

Table 1: Classification for Ocular Surface Burns			
Grade	Prognosis	Clinical Findings	Conjunctival Involvement
I	Good	Corneal epithelial damage	No limbal ischemia
II	Good	Corneal flash, iris details visible	<1/3 limbal ischemia
III	Guarded	Total epithelial loss, corneal flash, iris details obscured	1/3-1/2 limbal ischemia
IV	Poor	Corneal exposure, iris and pupil obscured	>1/2 limbal ischemia

Table 2: Ocular Classification for Ocular Surface Burns			
Grade	Prognosis	Clinical Findings	Conjunctival Involvement
I	Very good	0-8 clock hours of limbal involvement	0%
II	Good	> 8 clock hours of limbal involvement	< 30%
III	Good	Between 8-12 clock hours of limbal involvement	30-50%
IV	Good to guarded	Between 12-18 clock hours of limbal involvement	50-75%
V	Guarded to poor	Between 18-24 clock hours of limbal involvement	75-100%
VI	Very poor	Total limbal involvement (24 clock hours)	> 100%

CHEMICAL BURN

- Acidic (low pH) – car batteries, glass polish, vinegar, nail polish remover
- Sulfuric/sulfurous acid, hydrofluoric acid, acetic acid
- Basic/Alkali (high pH) – cleaning agents, fertilizers, plaster, cement
- Bleach, ammonia, lye, magnesium hydroxide, hydrated lime



CHEMICAL BURN – ACID

- Surface proteins bind to acid molecules (neutralizing the acid)
- Causes coagulative necrosis (creating a barrier)
- Generally less harmful than alkali (except hydrofluoric acid)



HYDROFLUORIC ACID???



CHEMICAL BURN – ALKALI (BASIC)

- Lipophilic (likes fat)
- Saponification of fatty acids on cell membrane
- Causes rapid penetration, destroying proteoglycans and collagen



CHEMICAL BURN – IRRITANTS

- pH not too far from neutral
- Usually causes more pain than damage
- Most household cleaners, pepper spray, chlorinated pools

MANAGEMENT – BEFORE ARRIVING

Via Phone Triage:

- Copiously flush the eye x 15min (eyewash station, shower, sink)
- Longer chemical contact time, the more damage will occur
- Open eyes as wide as possible
- Bring chemical/info



MANAGEMENT – IN-OFFICE

- Copiously flush the eye (~15min)
- Test with litmus paper (pH level 6-8)
- Clean lids well
- Debride necrotic tissue



Morgan Lens

MANAGEMENT (BASED ON ROPER-HALL)

Grade I:

- Perseverative-free ATs
- Oral pain meds (ibuprofen/acetaminophen)
- Cycloplegia (cyclogyl tid)
- Steroids (pred qid)
- Antibiotics (erythromycin ung)
- RTC every other day until healed

Colby, K., Chemical injuries of the Cornea. Focal Points in American Academy of Ophthalmology. 2020. 38(3): p. 3-14.

MANAGEMENT

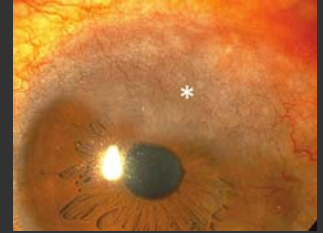
Grade II-IV: (Add/Change Grade 1 treatments)

- Cycloplegia (atropine bid)
- Steroids (pred q1hr or durezol 6x/day)
- Antibiotics (moxifloxacin tid)
- Doxycycline 50mg bid
- Amniotic membrane
- Topical/oral high-dose Vitamin A*
- RTC daily

Colby, K., Chemical injuries of the Cornea. Focal Points in American Academy of Ophthalmology 2010. 38(3): p. 3-14.
Kim EC, Kim TK, Park SH, Kim MS. The wound healing effects of vitamin A eye drops after a corneal alkali burn in rats. Acta Ophthalmol. 2012 Nov;90(7):e549-6.

COMPLICATIONS

- Limbal stem cell deficiency
- Limits epithelial healing
- Conjunctivalization*
- Tx: Increase steroids
- Sx: Limbal stem cell transplant
- Stromal involvement
- Permanently scarred
- Monitor for progressive melt
- Sx: Transplant



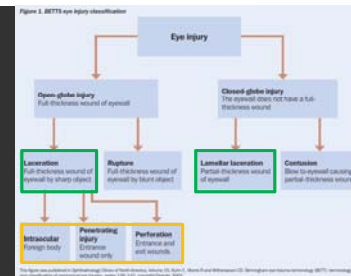
Felix, Segev. 2015. Corneal Angiogenesis: Etiologies, Complications, and Management. 10.57764/215.

COMPLICATIONS

- Symblepharon
- Affects eye movement, lid closure/misdirection
- Tx: Removal with amniotic membrane



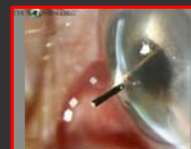
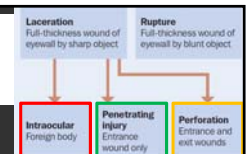
GLOBE LACERATIONS



HISTORY – LACERATIONS

- Onset (date/time if possible)
- Type of object (occur at work)
- Relieving factors
- Photophobia
- Pain on blink

OPEN GLOBE LACERATIONS



Outside-In Mechanism

SIGNS OF POTENTIAL OPEN GLOBE FROM LACERATION

- Significant vision loss
- Penetrating lid injury
- Peaked pupil
- Shallow anterior chamber
- Seidel sign
- Very low IOP*
- Lens dislocation
- Vitreous hemorrhage
- Deflated globe

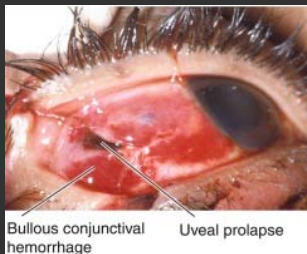


Pranavik S, Doshi A, Gething TA. Assessment and Management of Ocular Trauma. EyeRounds.org

EVALUATION – OPEN GLOBE LACERATIONS

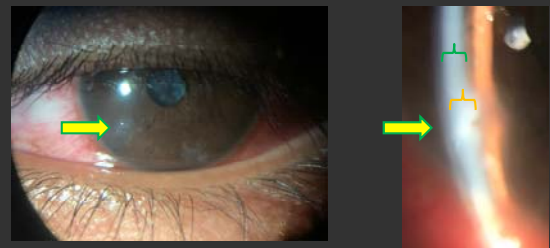
- Quick history
- Evaluation based on extent of damage, pain
- DO NOT check pressures, put pressure on eye (B-scan), motility
- Don't dilate

SCLERA

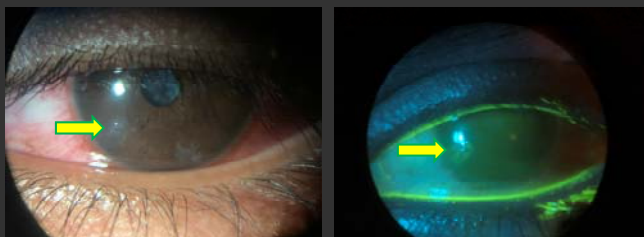


<https://renttoday.com/conjunctiva-and-sclera/>

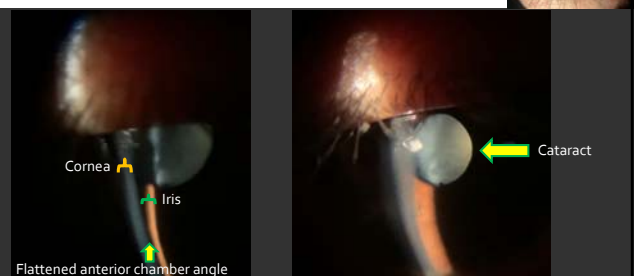
CORNEA



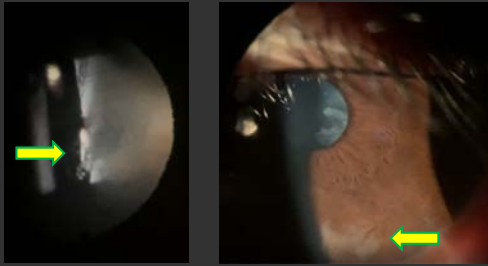
CORNEA



ANTERIOR CHAMBER/LENS



LENS CAPSULE VIOLATION



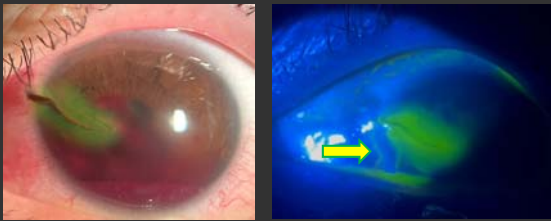
CORNEA/IRIS

- Peaked pupil, iris prolapse, flattened anterior chamber angle, hyphema

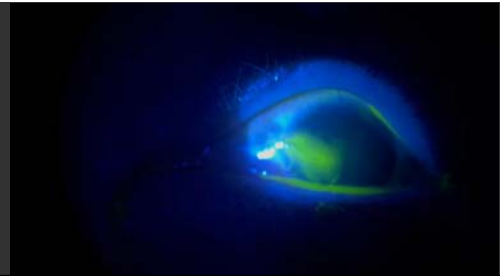


SEIDEL SIGN

- Aqueous leakage from anterior chamber



SEIDEL SIGN - VIDEO



CORNEA/IRIS

- Irregular pupil, corneal sutures



FIRST AID – SEIDEL SIGN

- Bandage contact lens
- Referral to corneal specialist for sutures
- If surgical care delayed, consider cyanoacrylate
 - Examples – Histoacryl



Vote BJ, Elder MJ. Cyanoacrylate glue for corneal perforations: a description of a surgical technique and a review of the literature. Clin Exp Ophthalmol. 2000 Dec;28(6):437-42.

LENS - CHALCOSIS LENTIS

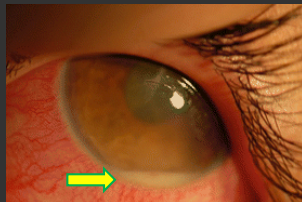


ECTOPIC INTRAOCULAR LENS



ENDOPHTHALMITIS

- Hypopyon – dense accumulation of neutrophils and fibrin
- Endophthalmitis – severe inflammation (infection) in the anterior/posterior segment
- Staph most common microbe



Codrea S., Cohen M.C. (2005) Traumatic Endophthalmitis. In: Yan H. (eds) Mechanical Ocular Trauma. Springer, Singapore.

MANAGEMENT – ENDOPHTHALMITIS

- Immediate ER/Surgery Center referral with retina specialist
- Remove foreign body
- Aqueous/vitreous tap
- Intravitreal antibiotic injection
- IV antibiotics
- Staph most common microbe



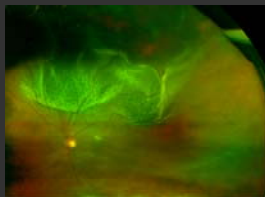
VITREOUS/RETINA

- Vitreous hemorrhage
- Rhegmatogenous retinal detachment

} B-scan NOT indicated if suspect open globe

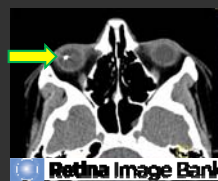


Acute-Onset Floaters and Flashes. JAMA 301: 2143-9.



INTRAOCULAR FOREIGN BODY – POSTERIOR

- May need CT or X-ray
- No MRI if metallic!!!



Retina Image Bank

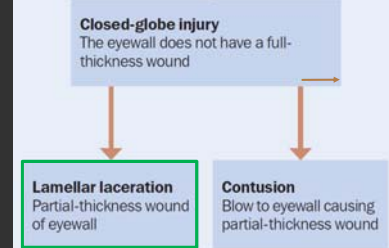


Retina Image Bank. Jeffrey G. Gross, MD, October 11 2013

MANAGEMENT

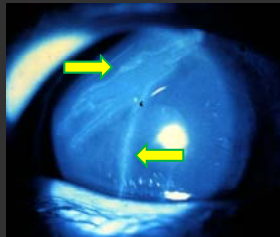
- Provide first aid
- Place shield over eye (not a patch)
- Can administer anti-nausea and pain medicines
- Immediate referral to ER/Surgery Center
- Aqueous/vitreous tap
- Intravitreal antibiotic injection
- IV antibiotics

CLOSED GLOBE LACERATIONS



CORNEA

- Loose epithelium
- Evaluate how deep it penetrated
- Must rule out corneal penetration
- Epithelium grows back with time
- Stromal damage results in permanent scarring

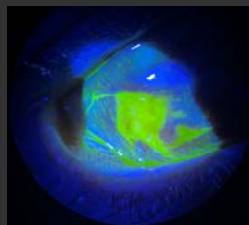


MANAGEMENT

- Debride loose epithelium
- Bandage contact lens
- Cycloplegia – In-office vs Rx based on size & pain
- Prophylactic topical antibiotics
- Topical/oral pain medications

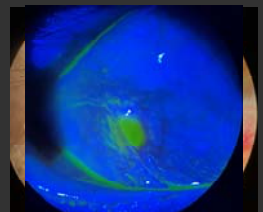
CONJUNCTIVA/SCLERA

- Chemosis
- Subconjunctival hemorrhage
- Must rule out underlying scleral penetration
- Move conjunctiva with surgical sponge
- Look at corresponding retina



CONJUNCTIVAL LACERATION MANAGEMENT

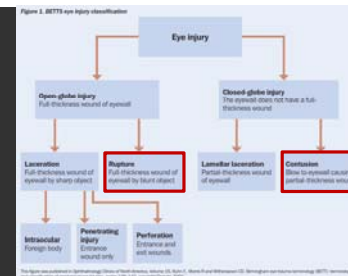
- If small, monitor without treatment
- If large, referral for conjunctival sutures
- In-office cycloplegia
- Prophylactic topical antibiotics
- Topical/oral pain medications
- If delayed care, consider cyanoacrylate
 - Examples – Histoacryl



SCLERAL LACERATION MANAGEMENT

- Place shield over eye (not a patch)
- Topical/oral pain medications
- Urgent referral for scleral sutures
- If surgical care delayed, consider cyanoacrylate
 - Examples – Histoacryl
- Prophylactic topical antibiotics

BLUNT TRAUMA

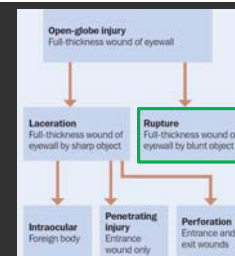


HISTORY – BLUNT TRAUMA

- Onset (date/time if possible)
- Situation at time of injury (occur at work)
- Relieving factors
- Pain on eye movement
- Prior ocular/facial surgeries
- Headache
- Decreased facial sensation (hypoesthesia) or ringing in ear (tinnitus)
- Double vision (diplopia)

Be careful taking history through others (abuse?)

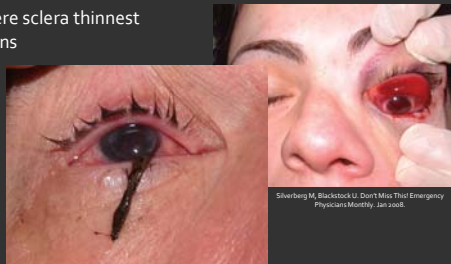
OPEN GLOBE RUPTURE



Inside-Out Mechanism

OPEN GLOBE RUPTURE

- Tears occur where sclera thinnest
- EOMs insertions
- Optic nerve
- Limbus
- Prior sx



Silverberg M, Blackstock U. Don't Miss Thoracic Emergency Physicians Monthly. Jan 2008.

SIGNS OF POTENTIAL OPEN GLOBE RUPTURE

- Significant vision loss
- Bulbous subconjunctival hemorrhage
- Seidel sign
- Peaked pupil
- Shallow anterior chamber
- Very low IOP
- Iridodialysis (iris detached from sclera)
- Lens dislocation
- Vitreous hemorrhage
- Deflated Globe

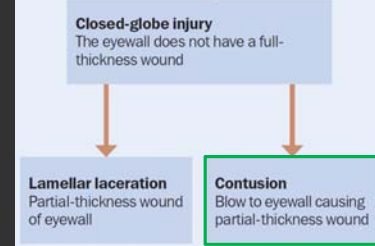


Pramank S, Doan A, Oetting TA. Assessment and Management of Ocular Trauma. EyeRounds.org

MANAGEMENT

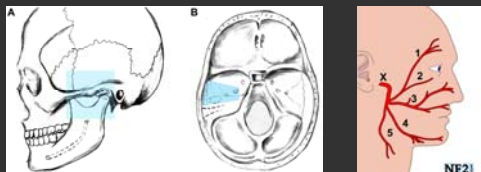
- Provide first aid
- Place shield over eye (not a patch)
- Can administer anti-nausea and pain medicines
- Immediate referral to ER/Surgery Center
- Aqueous/vitreous tap
- Intravitreal antibiotic injection
- IV antibiotics

CLOSED GLOBE INJURY



SYSTEMIC EVALUATION

- Decreased facial mvmt/sensation/hearing – orbital/temporal bone fracture
- CSF (cerebrospinal fluid) in nose or ears – basilar (base) skull fracture
- Immediate ER referral (meningitis)



Aloulabani AH. Facial/Nerve Palsy: Providing Eye Comfort and Cosmesis. Middle East Afr J Ophthalmol. 2020 Apr-Jun;27(2): 444-447.
Koren L, Waseem M. Orbital Floor Fracture. StatPearls Publishing; 2021 Jan.

ORBIT

- Periorbital hematoma/ecchymosis (black-eye)
- Diplopia (double vision)
- Pain on eye movement
- Enophthalmos (eye fell backward)
- Hypoglobus (eye fell down)
- Proptosis (eye pushed forward)

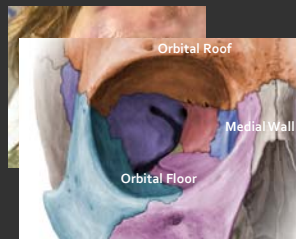


Crain A, Ganti L. Orbital floor fracture with periorbital hematoma. BMJ Case Reports CP. 2013;12(1): 2013-127795.

Koren L, Waseem M. Orbital Floor Fracture. StatPearls Publishing; 2021 Jan.

PERIORBITAL HEMATOMA/ECCHYMOSIS

- Palpate (feel)
- Crepitus (sound) – orbital emphysema (trapped air)
- 2° sinus fracture/medial wall fracture
- Advise patient NOT to blow their nose or valsalva maneuvers!
- Urgent referral to ER for imaging and possible same day repair

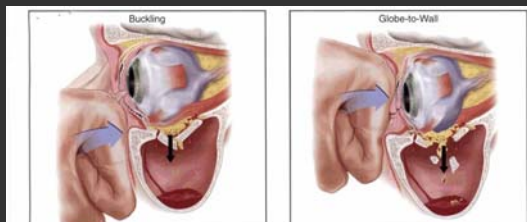


Crain A, Ganti L. Orbital floor fracture with periorbital hematoma. BMJ Case Reports CP. 2013;12(1): 2013-127795.

Koren L, Waseem M. Orbital Floor Fracture. StatPearls Publishing; 2021 Jan.

ORBITAL WALL/FLOOR FRACTURE

- Increased risk of orbital cellulitis



Brown, M & Ky, W & Loman, Richard. (1999). Concomitant ocular injuries with orbital fractures. The Journal of cranio maxillofacial trauma. 5, 43-6, discussion 47.

EOM ENTRAPMENT/TRAPDOOR FRACTURE

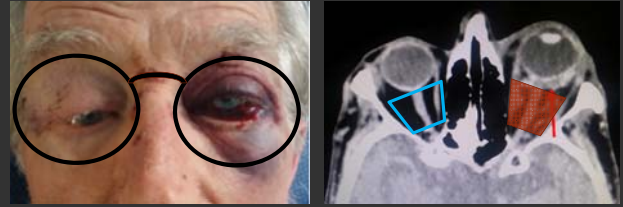
- Orbital fat and/or inferior rectus trapped causes superior gaze restriction
- Urgent referral to ER for imaging and possible same day repair



Craen A, Garth L. Orbital floor fracture with periorbital haematoma. *BMJ Case Reports* CP 2019;23(10):e2018.12779.
 Fournier L, Wassermann M. Orbital Floor Fracture. *StatPearls Publishing*; 2022 Jan.

ORBITAL COMPARTMENT SYNDROME

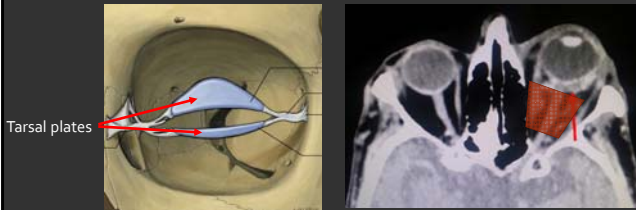
- Retrobulbar hemorrhage ↑ orbital pressure causing proptosis



Uguri, A. and Michael Perry. "Emergency management for orbital compartment syndrome-is decompression mandatory?" *International journal of oral and maxillofacial surgery* 45.11 (2016): 1435-1437.

ORBITAL COMPARTMENT SYNDROME

- Increased orbital pressure exceeds perfusion pressure of blood to eye



Uguri, A. and Michael Perry. "Emergency management for orbital compartment syndrome-is decompression mandatory?" *International journal of oral and maxillofacial surgery* 45.11 (2016): 1435-1437.

ORBITAL COMPARTMENT SYNDROME

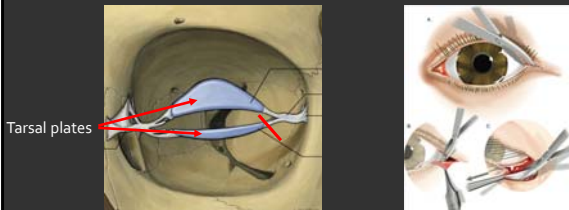
Signs:

- Marked lid chemosis (swelling) and/or ecchymosis (black eye)
- **Significantly reduced VA and APD**
- **Marked proptosis (eye pushed forward)**
- **Complete or restricted EOM movement**
- Extensive subconjunctival hemorrhage
- If suspected, STOP EXAM = TRUE OCULAR EMERGENCY
- Immediate ER referral

McCallum, Ewan et al. "Orbital Compartment Syndrome: An Update With Review Of The Literature." *Clinical ophthalmology (Auckland, N.Z.)* vol. 13 2489-2496. 7 Nov. 2019.
 Uguri, A. and Michael Perry. "Emergency management for orbital compartment syndrome-is decompression mandatory?" *International journal of oral and maxillofacial surgery* 45.11 (2016): 1435-1437.

SURGICAL MANAGEMENT

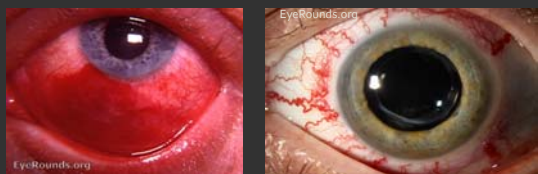
- Lateral canthotomy (lid) with cantholysis (ligament) <2 hrs



McCallum, Ewan et al. "Orbital Compartment Syndrome: An Update With Review Of The Literature." *Clinical ophthalmology (Auckland, N.Z.)* vol. 13 2489-2496. 7 Nov. 2019. doi:10.2167/2019.13.2489-2496.

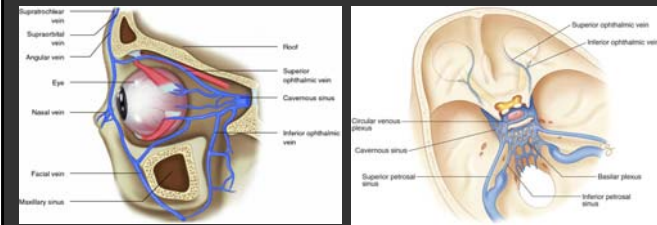
CONJUNCTIVA

- Subconjunctival hemorrhage
- Unique conjunctival hyperemia



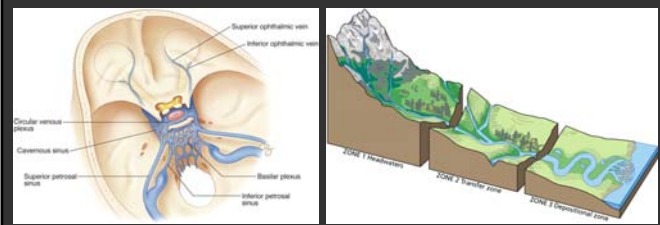
Fattah, T. (2003). Traumatic orbital cavernous fibrous histiocyte and treatment. *J Oculic Surg*, 29(1), 240-246.
 Kurtz K.J. *Clinical Methods: The History, Physical, and Laboratory Examinations*. 3rd edition. Chapter 18.

OCULAR BLOOD OUTFLOW



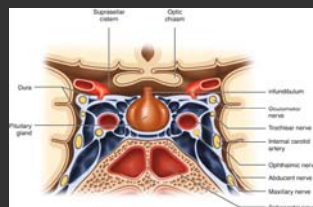
Arora MW, Niekirk A. The Blood Supply to the Eyeball. *Atlas of Ocular Anatomy*. pp 19-38.

OCULAR BLOOD OUTFLOW



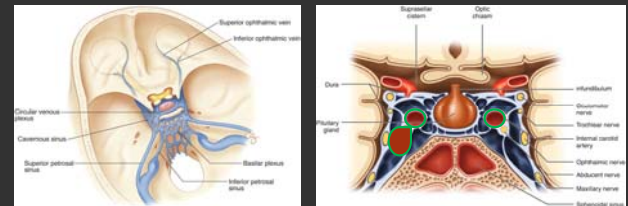
Fattah, T. (2003). Traumatic carotid-cavernous fistula pathophysiology and treatment. *J Oculofacial Surg*. 14(2), 240-246.
Kurtz K.J. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Chapter 18.

OCULAR BLOOD OUTFLOW



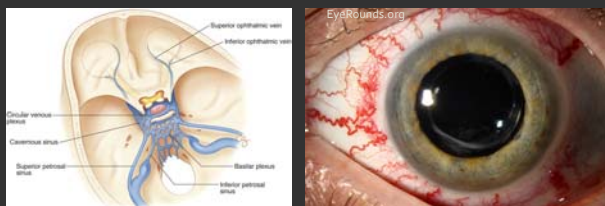
Kurtz K.J. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Chapter 18.
<https://www.pdfaii.com/en/search?q=oculofacial%20surg>

CAROTID-CAVERNOUS SINUS FISTULA



Fattah, T. (2003). Traumatic carotid-cavernous fistula pathophysiology and treatment. *J Oculofacial Surg*. 14(2), 240-246.
Kurtz K.J. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Chapter 18.

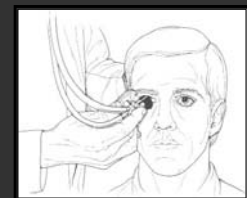
CAROTID-CAVERNOUS SINUS FISTULA



Fattah, T. (2003). Traumatic carotid-cavernous fistula pathophysiology and treatment. *J Oculofacial Surg*. 14(2), 240-246.
Kurtz K.J. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Chapter 18.

MANAGEMENT

- Traumatic mostly direct/high flow
- Orbital bruit (swooshing sound)
- Refer to ER ASAP!



Fattah, T. (2003). Traumatic carotid-cavernous fistula pathophysiology and treatment. *J Oculofacial Surg*. 14(2), 240-246.
Kurtz K.J. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Chapter 18.

ANTERIOR CHAMBER

- Traumatic uveitis



MANAGEMENT

- Topical cycloplegia (cyclo bid-tid)
- Topical steroids (pred qid)
- Aqueous suppressants if elevated IOP

ANTERIOR CHAMBER

- Blood in anterior chamber (hyphema)



HYPHEMA



<https://www.aao.org/image/hyphema-grading-system-a>

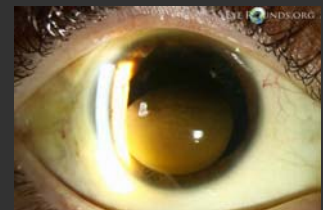


MANAGEMENT

- Most resolve < 5 days
- Head elevation at 30 degrees
- No strenuous activities
- Topical steroids and cycloplegics for traumatic uveitis
- Rx topical aqueous suppressants if IOP elevated
 - Consider oral diamox if not responding
 - Avoid AA/CAIs/hyperosmotics in sickle cell patients
- No NSAIDs or aspirin (ASA)

FOLLOW-UP MANAGEMENT

- Non-resolving hyphema
 - Consider aminocaproic acid, esp in high risk patients (promotes blood clotting)
- Corneal blood staining
- Anterior chamber washout



MANAGEMENT – SURGICAL

- Paracentesis with drainage for uncontrolled IOP
- Anterior chamber washout for total hyphema and/or corneal blood staining

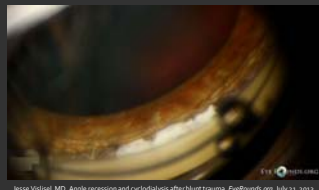


MANAGEMENT

- Wait 1-2 weeks after resolution to evaluate extent of damage
- Gonioscopy for angle recession
- High association with angle recession
- ~20% develop angle recession glaucoma

ANGLE

- Tear between longitudinal & circular fibers of ciliary muscle (angle recession)
- Detachment between ciliary body and sclera (cyclodialysis)



2006 Vidali, MD. Angle recession and cyclodialysis after blunt trauma. Eyeforums.org July 22, 2003

ANGLE RECESSION (GLAUCOMA)

- Angle recession can affect IOP outflow days, months, years later
- Greater extent of damage (>180°) = higher risk
- Unilateral secondary angle recession glaucoma, not POAG
- Aqueous suppressants, prostaglandin (later)

IRIS/CILIARY BODY

- Detachment of iris from sclera (iridodialysis)
- Iris vibrates on eye movement 2' lens (iridonesis)
- Detachment of ciliary body from sclera (cyclodialysis)

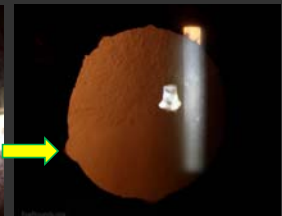
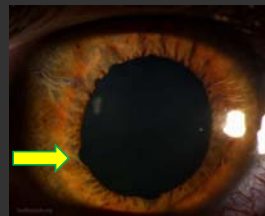


EYE HANDBOOK.ORG

<https://www.aao.org/eye-health/anatomy/diagrams>

IRIS

- Iris sphincter tears

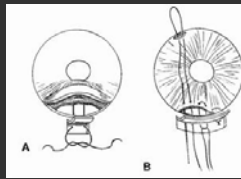


MANAGEMENT

- Sunglasses
- Colored or Prosthetic contacts
- Surgical repair



Young KK, Wong R. Colored Contacts: More Than a Pretty Eye. *Review of Ocular & Contact Lenses*. February 15, 2020.



© 2011 American Academy of Ophthalmology

LENS/IOL

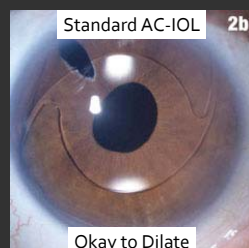
- Deposition of melanin pigment on the anterior lens capsule (Vossius Ring)
 - Lens dislocation (ectopia lentis)
 - IOL dislocation (ectopic IOL)
- } Non-urgent referral for anterior chamber IOL



ANTERIOR CHAMBER IOL



<https://www.santamicheli.com/wordpress/wp-content/uploads/2014/04/AC-IOL-Dislocation.pdf>



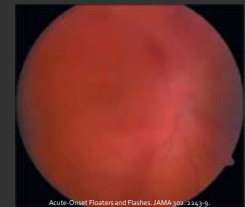
https://retinavitreous.com/treatments/dislocated_iol.php

VITREOUS

- Subhyaloid hemorrhage
 - Vitreous hemorrhage
- } B-scan to check for detachment



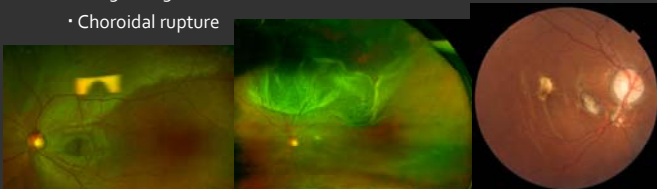
Retina (Fifth Edition), 2013



Acute-Onset Floaters and Flashes. JAMA 300:2143-9

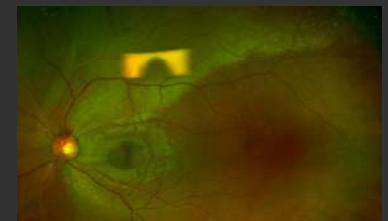
RETINA

- Commotio retinae
- Rhegmatogenous retinal detachment
- Choroidal rupture



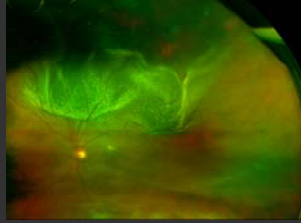
COMMOTIO RETINAE (BERLIN'S EDEMA)

- Mainly damages outer segments of photoreceptor and RPE junction
- No treatment
- Resolves weeks to months
- If present in macula, can permanently affect vision



RHEGMATOGENOUS RETINAL DETACHMENT

- Pre-Existing Risk Factors:
 - >3D myopia
 - Aphakia (without a lens)
 - h/o breaks, traction, thinning
- Consider B-scan
- Scleral depression?



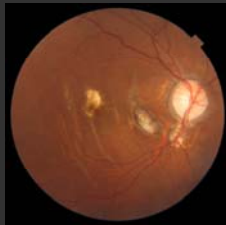
RHEGMATOGENOUS RETINAL DETACHMENT

- If macula ON
 - Immediate referral to retina specialist
- If macula OFF
 - Urgent referral



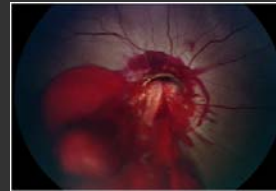
CHOROIDAL RUPTURE

- No treatment, unless CNVM – refer to retinal specialist (anti-VEGF injection)



OPTIC NERVE

- Avulsion of the optic nerve
- Traumatic Optic Neuropathy



Sherief ST, Connor AJ, Hosen CV, et al. Optic nerve avulsion, ultrasound and MRI findings. Adv Ophthalmol Vis Syst. 2015;6(3):128-133.



AVULSION OF THE OPTIC NERVE

- Disinsertion of ON fibers at lamina cribrosa = vision loss, APD
- No treatment



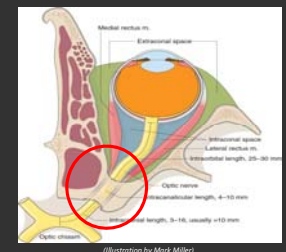
Sherief ST, Connor AJ, Hosen CV, et al. Optic nerve avulsion, ultrasound and MRI findings. Adv Ophthalmol Vis Syst. 2015;6(3):128-133.



King JS, Salami AA, Harvey and Remick Jones Eye Institute at the University of Arkansas for Medical Sciences. Retina Image Bank. July 5, 2018.

TRAUMATIC OPTIC NEUROPATHY

- Indirect shock from orbital impact to intracanalicular portion of nerve
- Direct penetrating injury cuts nerve
 - Foreign body/Bony fragments
- Usually need CT to visualize



TRAUMATIC OPTIC NEUROPATHY

- Causes vision loss, APD
- No treatment
- Conflicting studies using high dose steroids



THANK YOU

Questions?
doctorgonzales@gmail.com