The Oh Crap Moment: When Ocular Emergencies Happen!

Patient Case #1
- 32 year old Caucasian male
- Same day referral from Windham ER, patient was hit by exploding sparkler firework into his right eye.
- Swollen, painful red eye that was shut upon presentation
- Vision was unstable with excessive tearing.
- Patient has had prior surgery twice for a previous paintball injury in the same eye.

Exam
- VA: 20/20 OD, 20/25 OS
- Position of IOL findings:
  - Upper and lower lens haptics, no swelling and myopiasis
  - Open sulcus, iridodialysis present
  - No capsular tension, no flare present
- Dilated Fundus Exam:
  - Commotio retinae parafoveal, multiple chorioretinal scars extending from ONH to nasal macula
- IOP: 11 OD, 14 OS
- Dilated Fundus Exam:
  - Commotio retinal fundus, multiple chorioretinal scars extending from ONH to nasal macula

"Peek a Boo" IOL
- Exam
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  - Dilated Fundus Exam:
    - Commotio retinal fundus, multiple chorioretinal scars extending from ONH to nasal macula
### Treatment
- Cyclo 1% bid OD
- Durezol qid OD
- Generic Cosopt tid OD (pre-existing medication)
- Bacitracin ophthalmic ointment tid for abraded skin tissue

### Long Road Ahead
- Took 2-3 months for the Traumatic Iridocyclitis to resolve
  - It could take longer...
  - Luckily, pressure remained low and did not spike
  - It can...
- Be mindful of retinal pathology
  - Macula
  - Peripheral
  - Acquired Optic Neuropathy

### Injury Epidemiology
- Ocular injuries in children account for 20%–50% of all ocular injuries.
- Perforating eye injuries make up 21–24% of serious ocular trauma and are a significant cause of visual loss.
- It is estimated that they can be prevented in up to 90% of cases.
- There is a male predominance of 2–6:1

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### Ocular Emergency
- Immediate Appointment if any of the following:
  - Sudden, painless loss of vision
  - Sudden onset of flashes/floater
  - Chemical burn: Have patient irrigate eye under running water for 20 minutes prior to coming
  - Potential penetrating injuries
  - Injury to head/neck or eye

### It's all about the Benjamins—Well at least Franklin
- Our instincts are what guide us best...
- "By failing to prepare, you are preparing to fail."
- Always remember to “Keep Calm”
- "Most importantly: G-d heals and the doctor takes the fee."

### Educate Staff on Emergency Protocol
2 is 1, 1 is none

- Use a systematic approach that engages front and back office staff to prepare and manage emergent cases.
- Invaluable preparations can be made in advance of any incident.
- Make effective and critical decisions that can be managed quickly (not rashly).
- All staff and doctors should know how to respond confidently.
- AOA Standard of Conduct

Section B. Emergency Optometric Care

“A request for optometric care in an emergency should receive immediate response. Once having undertaken an emergency case, an optometrist shall neither abandon nor neglect the patient.” Ethics in Clinical Optometry

Patient Case #2

- 17 year old female
- 3 days ago, patient was hit OS by another person’s head while playing soccer.
- Black eye OS with swelling and tenderness upon touch
- Vision stable
- Mother concerned about internal bleeding
- Urgent care visit 3 days ago: Ice and ibuprofen

Exam

- VAsc 20/30 OD, 20/30 OS
- Positive findings:
  - Upper and Lower left lid: 2+ swelling and ecchymosis
  - Subconjunctival Hemorrhage inferior and temporal
  - IOP Ta 14mmHg OD, 16mmHg OS at 4:50 pm
  - Dilated Fundus Exam: WNL OU
  - All other exam findings WNL OU

Be Suspicious

- Assume the worst until it is ruled out
- Blunt Ocular Trauma: Always maintain a high index of suspicion for what is often an occult injury.
- Patients with a history of significant ocular and pericocular blunt trauma should be considered ruptured until proven otherwise.

History

- Take a careful history (clinical and legal reasons)
  - High or Low velocity injury
  - Circumstances of Injury
  - Prior Eye Surgery
  - Vision: Reduced vision and/or Diplopia
  - Pain
  - RD symptoms (flashes, floaters, curtain/veil)
- Was patient wearing eye protection?
History

- Is patient systemically stable?
- Nausea, vomiting
- Young Patients with Blunt Trauma

White-Eyed Blowout Fractures (WEBOF)

EOM testing crucial!

Orbits

- Enophthalmos = ruptured globe

- Orbital Blowout Fracture:
  - Orbital crepitus indicates subcutaneous emphysema from an associated sinus fracture.
  - Numbness of cheek, upper lip, and/or teeth.

Protecting the Eye

- If there is suspicion of a ruptured globe:
  - Never patch the eye
  - Cover with a Fox Shield or you can MacGyver it...

Imaging Techniques

- CT scan of brain and orbits with thin cuts (1.5mm or less) (NOT MRI) to evaluate for:
  - Intraocular foreign body (IOFB)
  - If wood suspected, obtain MRI after CT
  - Orbital fractures
  - Other head trauma

*If CT not immediately available, obtain plain X-ray of orbits pre-operatively and CT (as above) post-operatively.
Bilateral Eyelid Bruising

Battle's Sign

Highly suggestive of basilar skull fracture, with a positive predictive value of 85%. They are most often associated with fractures of the anterior cranial fossa.

Double vision?

Key Questions to ask for Diplopia Cases:
- Monocular or Binocular Diplopia?
- Comitant - angle of deviation remains the same in all gazes with no limitation to ocular movement
- Hereditary, uncorrected refractive error
- Incomitant - angle of deviation varies in different gazes with no limitation to ocular movement. Secondary-secondary angle deviation.
- Usually from traumatic injury or vascular disease

Monocular or Binocular Diplopia?
- Comitant
- Hereditary, uncorrected refractive error
- Incomitant

Dangerous Diplopia Cases to Detect

- Diplopia due to Pupil Involving CNIII Palsy
- Problem with more than one of the following: lid, pupil, eye movement
- Multiple cranial neuropathy

Diplopia variable due to weakness or fatigue
- Diplopia with onset of new kind of headaches, scalp tenderness, pain with chewing.

Pupils

+APD
- R/O compressive optic neuropathy from retrobulbar hemorrhage
- STAT REFERRAL
- A peaked, teardrop-shaped, or otherwise irregular pupil suggests globe rupture.

Conjunctiva

- Conjunctival lacerations may overlie more serious scleral injuries.
- Severe subconjunctival hemorrhage (often covering 360 degrees of bulbar conjunctiva)
- Retrobulbar hemorrhage
- Scleral rupture
- STAT REFERRAL
Cornea and Sclera

- Check for Seidel's Sign

Patient Case #3

- 25 year old Indian male
- Same day referral from UConn Infirmary, patient was exposed to trifluoroacetic acid from a chemical experiment explosion in the laboratory.
- Swollen, painful red eye that was shut upon presentation
- Vision was relatively stable with excessive tearing.
- At laboratory bench, immediate action taken to flush with a Morgan Lens present for several minutes.

Exam

- VA 20/30 OD, 20/20 OS
- Positive findings:
  - 2 areas of epithelial and intrastromal central corneal defects measuring approximately 4 mm in size (~35% of the cornea)
  - 1+ to 2 bulbar and palpebral conjunctival injection/hyperemia
  - pH measurement: 7
- IOP(oc) T a 18mHg OD, 16mHg OS at 2:18 pm
- No Seidel Sign: Must rule out necrotizing tissue for risk of perforation

Acid vs. Basic Chemical Burn Scales

Treatment

Standard Care (I/II)
- Cyclopia
- Topical Antimicrobials (ointments to fluoroquinolones)
- Topical Steroids (Yes, they do help!)
- Preservative Free AT
- Oral Vit C (2 g)
- Doxycycline (100 mg)
- Debridement

Advanced Care (III/IV)
- Ascorbic Acid (10%)
- Citrate (10%)
- Platelet Rich Plasma
- Debridement
- Amniotic Membrane
- Limbal Stem Cell Transplant
- COMET
- Boston Keratoprosthesis
Amniotic Membranes

- Fetal Wound Healing
- Rapid uptake of nutrients and mobilization of stem cells.
- Similar to therapeutics, earlier initiation of membrane allows for better response.
- Cautionary Note
  - Wet cryopreserved = Wound Healing
  - Dry cryopreserved = Wound Coverage

Savage Commentary

“People are not Perdue Oven Stuffer Chickens with pop up timers.”

Words of Caution...

- A white and quiet eye is not always better
- Indicative of alkali burn that has caused diffuse conjunctival ischemia and blanching of vessels.

Patient Case #4

- 30 yo Caucasian female
- Windham Hospital Emergency Room for a Girl Fight at the Strip Club after candle holder with hot wax candle thrown at head.
- Swollen, painful red eye that was shut upon presentation
- Vision is significantly decreased and pain scale is...
- Let’s talk about the background to the present scenario
Exam

- VA: 20/200 OD, 20/20 OS
- Positive findings:
  - Geographic central corneal epithelial defect measuring approximately 5.5 mm round in size (~70% of the cornea)
  - 2+ bulbar conjunctival injection/hyperemia
  - Luckily, no anterior chamber reaction (Yet...)
  - Unable to get IOP measurement at initial visit
  - No Seidel Sign

Recurrent Corneal Erosion (Syndrome)

- Chronic relapsing disease of corneal epithelium
- Characterized by disturbance of epithelial basement membrane
- Defective adhesions
- Recurrent breakdown of corneal epithelium
- Redness, photophobia, tearing
- Usually at night or upon awakening
- May be related to REM during sleep cycle

History

- First reported in 1872
  - Hansen: “Intermittent neuralgic vesicular keratitis”
  - Antecedent trauma
- Szili (1900): “epithelial irregularities and gray dots”
- Stood (1900): “trauma to corneal epithelium and anterior stroma -> inability of new epithelium to form normal attachments to injured anterior basement layer.”
- Vogt (1921): “fine white dots on Bowman’s layer; fluorescein staining lines; irregular epithelial surface with localized edema.”

Epidemiology

- Case Series; Brown, BJO 60:84-96, 1976
  - Age: 24-73
  - Highest incidence in 3rd and 4th decade (Avg: 42.5 yo)
  - Initial abrasion to 1st recurrence: 2 days – 16 yrs
  - Dominant inheritance in 3%
  - 10% of cases are bilateral

Most Common Symptoms & Frustrations

- Pain
- Watering
- Blurred Vision

Management can be frustrating for both patient and doctor
- Patient discouraged because of recurrent pain and decreased vision
- Doctor disheartened by inability to cure disease
**Etiology/Pathogenesis**

**Primary**
- Epithelial basement membrane dystrophy
  - Map-dot-finger
- Dystrophies involving Bowman’s layer
  - Reis-Bucklers
  - Thiel-Behnke
- Stromal dystrophy
  - Lattice
  - Macular
  - Granular

**Secondary**
- Degeneration
- Trauma
- Post Refractive Surgery

**RCE Rapid Fire**
- Incidence of RCE 1:150 cases following a traumatic abrasion
- Majority – 87% (one study) occur within the lower half of the cornea irrespective to the etiology
  - In close proximity to Hudson-Stahli line
- Tiredness, menopause, menstruation, and alcohol were recognized as aggravating factors
- EBMD cases who suffer trauma are more likely to suffer from RCE

**Anatomy Dysregulation**
- Detachment of corneal epithelium following an abrasion appears faulty
- Variety of adhesion complex defects have been observed
- Reattachment of Bowman’s layer has been observed
- Absence of BM and hemidesmosomes
- Corneal Epithelium
  - Development of pseudoepithelial hyperplasia
  - Dystrophic collections of collagen and amorphous debris are found within the BM (due to aberrant BM)
- Leads to elevation of BM and accumulation of underlying debris and the further formation of abnormal BM
  - Cycle self-perpetuates

**How to Communicate RCE**
- Skin of the eye is not healing or bonding correctly
  - Primer and Paint
  - Crumb coat and Fondant

**What To Say If “Things” Go South**
- More often than not, these conversations occur after the 2nd or more commonly 3rd episode.
  - **Pearl:** Apologize without apologizing.
- Create an actionable plan
  - Allow for patient input
  - Explain customization
- Share latest technology
  - Motivate
Diagnosis

- History of previous trauma to involved eye
- SLE with indirect illumination
- Retroillumination after dilation
- Rugged grayish-staining area of epithelium
- Cellulose sponge test looking for loose epithelium
- "Positive cellulose sponge test"
- Topography
- Anterior OCT imaging

Treatment Options

**Medical**— (~95% successfully managed, 70% remaining symptom free x 1 yr, 40% 4 years)
- Promoting epithelial regeneration
  - Patching (rest)
  - bandage contact lenses
- Antibiotics, cycloplegics, hyperosmotics, corticosteroids, immunomodulation
- Oral tetracyclines and Vitamin C
- Mechanical
  - When medical management is not successful
    - Debridement + Amniotic Membrane
    - Anterior Stromal Puncture (ASP)
    - Phototherapeutic keratectomy (PTK)
    - Diamond bur superficial keratectomy
    - Nd:YAG Alcohol Delamination

**Oral**
- Tetracyclines and Vitamin C

**Mechanical**
- When medical management is not successful
  - Debridement + Amniotic Membrane
  - Anterior Stromal Puncture (ASP)
  - Phototherapeutic keratectomy (PTK)
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**Words of Wisdom**

- Reach out to your Optometry and Ophthalmology peers for collaborative care support or 2nd opinion.
- Be wary of long term complications
  - Dry Eye Disease
  - Lid and Palpebral Conjunctiva scarring/madarosis/shortening
  - Cicatricial Ectropion/Entropion
  - Glaucoma (15-55%)

Anterior Chamber

- A shallow anterior chamber may be the only sign of occult globe rupture and is associated with a worse prognosis.
- Rule out Hyphema
- Traumatic Iritis
- Post surgical

Patient Case #5

- A 19 year old Caucasian male presents as a same day referral from the UConn Sports Medicine department for a left eyelid and left side of nose lacerations along with blurry vision secondary to slashing during a hockey practice.
- The lacerations have been stitched (8 interrupted 6-0 nylon sutures), but the physician’s letter is concerned about the vision in his left eye.
- Slightly opaque corneal appearance on external exam.
- *Anxious about his prognosis due to his playing status and scholarship***

**Findings**

- VA: CC: 20/20 OD; 20/100 OS (PH 20/40)
- Pupils hard to analyze due to corneal haze OS, but appear reactive without APD OU
- IOP: 13 OD, 22 OS
- Gonioscopy did not reveal angle recession, 3+ 360, flat iris approach, +PAS (OS)
- AC: No hyphema OU, No cell OD, 3+4 cell OS
- Dilaton revealed no H/T/P/D 360 and mild commotio retinae. Scleral haze began to clear after administration of dilaton drops and Alphagan P.
- VA post dilation was 20/20 OS.
Treatment

- Externally picture taken for medico-legal purposes.
- Called parents after verbal agreement with patient.
- Patient was seen daily and given the following regimen:
  - Cyclo 1% bid OS
  - PredAcetate 1% 8x/day OS for 2 days, then cycled down thereafter based on appearance.
  - Alphagan P tid OS
- Day 2
  - VA was 20/30 OD, 20/25 OS
  - IOP was 12 OD, 14 OS
  - AC reaction dropped from 3+ to 1+ cell OS
- No stromal haze, but commotio retinae still present.

Hyphema Presentation

- Micro to Eight Ball, Hypopyon may be present

Hyphema Grading Scale

- Grade 0: No visible layering, but red blood cells within the anterior chamber (microhyphema)
- Grade I: Layered blood occupying less than one third of the anterior chamber
- Grade II: Blood filling one third to one half of the anterior chamber
- Grade III: Layered blood filling one half to less than total of the anterior chamber
- Grade IV: Total filling of the anterior chamber with blood.

Findings and In Office Treatment

- Seidel Sign was negative.
- Removed all metal fragments with 30G needle and #11 Disposable scalpel. Gentle buffing with Alger Brush thereafter.
- Gonioscopy revealed 3+ 360, no angle recession or PAS
- Dilated Fundus examination revealed mild commotio retinae, PVD, no H/T/RD 360

Patient Case #6

- 45 year old Hispanic male presents for an emergency with a painful right eye after the cap from his Corona Light bottle popped off as a projectile into his eye. Pain scale 10 of 10.
- VAcc: 20/70 (PHNI) OD, 20/25+2 OS
- Multiple metal fragments in cornea– central, @2, 8
- AC: 2+–3 cell OD and Grade 1 hyphema; no cell OS
- IOP: 9 OD, 12 OS
- No prior Hx of trauma and no Hx of Sickle cell anemia.
Treatment (at home)
- Day 1
  - Cyclo 1% bid OD only
  - Pred Acetate 1% 6x/day OD only
  - Risk of rebleed in literature, so I titrated the dose
  - Besivance q4d OD only
  - Bandage lens inserted and positioned
  - Pt advised no heavy lifting, bed rest, and no drinking Corona Light or any beer bottle/can until further notice

It Gets Better...
- Days 2 to 5
  - VA is 20/30+1 OD (PHN), 20/25 OS
  - Grade 1 Hyphema slowly resolves to resolution by day 5
  - AC reaction decreases to tr-1+ cell by day 5
  - No commotio retinae evident on dilated examination
  - Corneal wound sites sealing in nicely. BCL was removed on Day 2.
  - Treatment was titrated as follows:
    - Cyclo 1% remained at bid
    - Pred Acetate 1% tapered from 6-4-3 to bid by day 5
    - Besivance qid until Day 10, then stopped

Then It Gets Worse...
- He cracked open another Corona Light towards his face and flew back into the same eye about 2-3 weeks later!
  - Hyphema was Grade 0-1, started same regimen.
  - I instructed him to pop the cap off in a towel or simply away from his face next time...
  - The only residual issue was his refractive error acquired astigmatism likely due to the corneal injuries.

If you do see Hypopyon...
- Suspect Herpetic Infection or Ghost Cell Glaucoma

Iris

Lens

Uveal Prolapse= Globe
65 year old patient complains of severe headaches temporally on the right side and blurry vision in the right eye for several days. Dilated exam reveals optic nerve edema but no hemorrhages.

- What other questions would you ask?
- Are we the only providers she has seen?
- What ophthalmological information is pertinent to collect?
- How would you manage and treat this patient?
Findings

- VA OD: 20/800 OD (PH 20/400); 20/400 OS (PH 20/20)
- 2+ APD OD, sluggish
- SLE WNL and No cell evident
- Pseudophakia OU w/ mild PCD
- CNH edematous OD, no disc heme present
- OS had a question of pallor vs. pseudopallor
- 1+ J RPE changes, moderate sized drusen x2
- 1 Cotton-wool spot seen along the sup arcade

Diagnosis and Treatment

- AAION w/ tentative GCA/Temporal Arteritis pending biopsy
- Sent to ER immediately for further evaluation and recommended administration of corticosteroids prior to biopsy even with a pending physical examination.
- Bloodwork for ESR/CRP and CBC w/ differential given to patient to hand deliver to ER team

Unfortunately, the damage was done. He survived the incident, but his vision was CF 2' post treatment.

Urgent Care Equipment & Supplies

- Alger Brush
- Spud
- pH Indicator (0-13)
- Fox Shield
- Media for Culturing (ie. Plates, Rapid Culture Tubes)
- Betadine Wash
- Rapid Pathogen Screening
- Glaucoma Medications: topical and oral for emergencies
- Steroids and Mydriatrics for Acute Uveitis/Iridocyclitis
- Topical Anti-bacterial Medications

Annual Exams REQUIRED

- Ocular Trauma Patients followed for life:
  - Angle recession glaucoma
  - Cataract
  - Peripheral retinal tear
- Statistics indicate that patients who have trauma in one eye are likely to have trauma in the other eye and are more likely to die from trauma later in life.

An ounce of prevention is worth a pound of cure.
-- Benjamin Franklin