Chapter 22 – Red and Painful Eye

Episode overview:

1) Describe the Relative Afferent Pupillary Defect, how it is diagnosed, and list a differential diagnoses for this finding
2) List 6 treatment options for Acute Angle Closure Glaucoma
3) Describe 5 history or physical exam findings that distinguish between periorbital cellulitis and orbital cellulitis

Wisecracks

1) What are the causes of exophthalmos?
2) How can you differentiate between viral and bacterial conjunctivitis?
3) Causes of anisocoria?

Rosen’s in Perspective:

➢ Review your eye anatomy in Rosen’s

➢ Recap the key components of the eye exam:

Eight Key Components: VVEEPP + Slit Lamp + Fundoscopy

VVEEPP

▪ Visual acuity (Vital Sign)
▪ Visual field testing
▪ External examination
▪ Extraocular movements
▪ Pupillary evaluation
▪ Pressure Determination

Fundoscopy
VVEEPP Explained

1. **V: Visual acuity (vital sign of the eye):**  
   a. Snellen eye chart at 20 feet or Rosenbaum chart at 14 inches  
   b. Allen chart for young children and infants  
   c. If they cannot use the chart:  
      i. Are they able to read the paper/phone?  
      ii. Counting fingers  
      iii. Perceive hand motion  
      iv. Able to perceive light

2. **V: Visual field testing**  
   a. Confrontational field testing (*not* accurate for small field cuts)  
      i. But this rarely changes the ED management

3. **E: External examination**  
   a. Of both external eyes and surrounding structures (facial bone fracture, etc.)  
   b. Globe position: exop/enophthalmos (proptosis)  
   c. Conjugate gaze  
   d. Periorbital soft tissues, bones, sensation  
      i. Examination of upper a lower eyelids, *including eversion***  
      1. Ensure no foreign body  
      ii. Assess adjacent structures

4. **E: Extraocular muscle movement**  
   a. Assess the eyes through ALL the cardinal movements of gaze  
   b. Inquire about diplopia (especially at the extremes of gaze)  
      i. This may suggest ocular muscle entrapment, or functional edema

5. **P: Pupillary evaluation**  
   a. Assess size, shape, reactivity  
   b. Assess for RAPD using the swinging flashlight test

6. **P: Pressure determination**  
   a. Intraocular pressures normally 10-20 mmHg  
   b. IO HTN Differential Diagnosis:  
      i. Glaucoma  
      ii. Suprachoroidal hemorrhage  
      iii. Retrobulbar pathology  
   c. Pressures in the 20-30 range should get ophthalmology follow-up  
   d. Pressures OVER 30 mmhg need **rapid** treatment
Slit lamp examination - explained
- A systematic, magnified view of the conjunctivae and anterior chamber
- Will not help you with something posterior to the lens

- Lids and lashes
  - Blepharitis
  - Hordeolum (lid abscess)
  - Dacryocystitis

- Conjunctiva and sclera
  - Punctures, lacerations, inflammatory patterns

- Cornea (with fluorescein)
  - Abrasions, ulcers, foreign bodies
  - Angled beam is needed to assess depth perception
  - Edema (white haze / cloudiness)

- Anterior chamber
  - Cells (RBCs or WBCs) and flare (diffuse haziness)
  - Hyphema or hypopion
  - Foreign bodies

- Iris
  - Red light reflex
  - Tears in the iris - iridotomy

- Lens
  - Position,
  - Clarity
  - Cataracts
  - Artificial vs. native lens

Fundoscopy - explained
To help in you in cases of:
- Visual loss and/or vision changes
- Can find lens dislocation

- Non-dilated exam is commonly performed in the ED
  - Because of the risk of causing AACG (acute angle closure glaucoma)

- Inability to obtain the red light reflex (pearl)
  - Corneal opacification
  - Hyphema or hypopion
  - Miotic pupil
  - Lens cataracts
  - Blood in the vitreous
  - Retinal detachment
Bedside testing:
- Fluorescein testing - uptake occurs only in damaged corneal tissue.
  - Under slit-lamp Cobalt blue light:
    - Have the patient blink, if there is uncertainty regarding the uptake of fluorescein on the cornea
- Local anesthetic testing:
  - If the anesthetic abolishes the patient’s eye pain - the pain is of corneal origin
  - If the pain is mildly relieved - probable conjunctival origin
- Seidel’s sign:
  - Use with the suspicion of ocular penetration
    - Leaking aqueous fluid is detected by diluted fluorescein.
      - The fluorescein strip MUST BE HELD DIRECTLY OVER THE SUSPECTED AREA OF CORNEAL DISRUPTION

Ancillary testing:
- ESR and CRP - may help in cases where temporal arteritis is suspected
  - **however TA can occur with NORMAL levels of ESR and CRP**
- CT orbits and facial bones to rule out free air, FB's, fractures,
- Ultrasound - good at detecting foreign bodies, but CT is better at delineating the damage caused by intraocular foreign bodies

1) Describe the Relative Afferent Pupillary Defect, including:
   - How it is diagnosed
   - List a differential diagnosis

Assess for RAPD using the swinging flashlight test:

i. Patient looks at a distant object
ii. Room lights are dimmed
iii. Flashlight is swung from one eye to the other (not obstructing their visual line)
iv. The direct and consensual light reflexes are assessed
   a. These are mediated through cranial nerves - the afferent, or sensory, limb corresponds with the optic nerve (CN II), while the efferent, motor, limb corresponds with the oculomotor nerve (CN III) “Two In, Three Out”
   b. Is positive if the pupil dilates with the direct beam of light, while constricting with consensual response.

v. Causes of RAPD - the sensory, CN II, is not functioning
   a. Inhibition of light transmission to the retina
      i. Vitreous hemorrhage
      ii. Loss of the retinal surface
      iii. Ischemia or retinal detachment
      iv. Prechiasmal optic nerve lesion - optic neuritis
2) List 6 treatment options for Acute Angle Closure Glaucoma

**Acute angle closure glaucoma:**

**Symptoms:**
- Sudden onset eye pain and blurred vision, with frontal headache, N/V, shallow anterior chamber, fixed mid-dilated pupil, limbal injection

**Treatment:**

i. *Decrease production of Aqueous Humour*
   - Timolol 0.5% 1 drop, then repeat in 30 minutes
   - Apraclonidine 1% 1 drop once
   - Acetazolamide 500 mg PO - to reduce aqueous humour production
     - Methazolamide 50 mg PO instead of acetazolamide if patient has sickle cell disease

ii. *If IOP>30 (emergency)*
   - Constrict pupil
     - Pilocarpine 4% 1 drop, then repeat in 15 minutes
   - Establish an osmotic gradient:
     - Mannitol 2 g/kg IV

iii. *Decrease IOP (other treatments)*
   - Head of bed at 30 degrees
   - Anti-emetics for prevention of N/V and prevent coughing
   - Analgesics

iv. *Decrease inflammation:*
   - Prednisolone 1% 1 drop q 15 minutes

Just to recap; in order of importance:
1. Timolol
2. Acetazolamide
3. Head of bed at 30 degrees, prophylactic anti-emetics, and analgesics

3) Describe 5 History or Physical exam findings that distinguish between peri-orbital and orbital cellulitis

**Orbital (or post-septal) cellulitis**

**Etiology**
- Maxillary/ethmoid sinusitis
- Orbital trauma
- Dental Infection

**Symptoms**
- Eyelid swelling / redness
- Warmth of skin overlying orbit
- Tenderness over bone
- Palpebral injection/chemosis of the conjunctiva

**Need CT to rule out abscess**
Important Differences to Periorbital Cellulitis

- Fever
- Ill / Toxic appearance
- Blurred vision
- Proptosis
- Painful or limited extraocular movements
- Binocular diplopia
- Edema of optic disk
- Venous engorgement of the retina

Management

Further Work Up

- Measure IOP, if >20 may need surgery
- Blood cultures
- CT orbits to rule out:
  - Foreign body
  - Emphysema
  - Hematoma
  - Abscess
  - Osteomyelitis
  - Cavernous sinus thrombosis
- Consider lumbar puncture
- Admission to hospital

Treatments

IV Antibiotics for skin and sinus flora

- Pip-Tazo 4.5g IV plus Vancomycin 15-20mg/kg IV
- OR
- Ceftriaxone 2g IV plus Metronidazole 500mg IV

Complications:

- Meningitis
- Cavernous sinus thrombosis

Periorbital cellulitis (or pre-septal)

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Symptoms</th>
<th>Considerations</th>
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<tbody>
<tr>
<td>Bug bite</td>
<td>Lid erythema, warmth, tenderness, and swelling</td>
<td>Mostly in children</td>
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<tr>
<td>Trauma</td>
<td>Low grade fever</td>
<td>RARELY leads to orbital cellulitis</td>
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<tr>
<td>Sinusitis</td>
<td></td>
<td>Usually strep/staph species</td>
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Treatments

MILD CASES

- Clindamycin 300mg PO q8hrs x 10 days OR
- Clavulin 875 PO BiD x 14 days + Septra double strength TID x 10 days

MODERATE-SEVERE CASES or <1 year old

- Ceftriaxone
  - + Vancomycin or Clindamycin

Someone with periorbital cellulitis has no worrisome features and typically normal CT scan. They rarely progress to orbital cellulitis but should have pediatric or ophthalmologic follow-up
Wisecracks:

1) What are the causes of exophthalmos?
   - These ALL increase the intraocular pressure
     - Orbital cellulitis with/without abscess
     - Retrobulbar hematoma (most common)
     - Hyperthyroidism (enlarged ocular muscles)
     - Orbital emphysema or inflammation (retained foreign body)

What are the causes of enophthalmos?
   - Contralateral proptosis
   - Penetrating globe injury causing vitreous extrusion

2) How to differentiate between bacterial vs. viral conjunctivitis?
   - Still NO good evidence exists to distinguish between the two
     - Weak positive LR of 3.1 for bacterial IF
       - Sticking eyelids in the AM plus mucoid/purulent discharge

3) What are the causes of Anisocoria?
   i. Previous eye trauma
      - Globe injury
      - Afferent or efferent nerve dysfunction
      - Ciliaris or iris paralysis
   ii. Previous eye surgery (iridotomy)
   iii. Synechiae from prioriritis
   iv. Physiologic (up to 10% of the population)
   v. Medication related (drugs)
   vi. Serious causes:
      a. Uveitis
      b. AACG