Pediatric Ophthalmic Infections and Injuries

Honey Herce, MD
Assistant Professor in the Department of Ophthalmology
Texas Children's Hospital
Baylor College of Medicine
Objectives

Be able to perform a basic eye exam.

Be able to manage common ophthalmic findings in children.

Be able to identify key exam points for ocular trauma.
Diagrammatic view. The vitreous humor is illustrated only in the bottom part of the eyeball.
Eye Infections and Injuries

- Nontraumatic
  - Subconjunctival Hemorrhage
  - Conjunctivitis
  - Keratitis
    - Microbial Keratitis
    - Marginal Keratitis
  - Uveitis
  - Periorbital Ecchymosis
  - Orbital Cellulitis

- Traumatic
  - Subconjunctival Hemorrhage
  - Chemical Burns
  - Iritis
  - Corneal Abrasions
  - Corneal Foreign Bodies
  - Orbital Fractures
  - Hyphemas/Uveitis
  - Lid Lacerations
  - Open Globe
Get a Good History of the Child’s Eyes

Past eye history
- Prior surgeries
- Ocular medications
- Ocular diagnoses
- Use of glasses or contact lenses

Preexisting visual impairment
- Amblyopia (lazy eye)
- Other causes of visual impairment

Event history
- Onset of complaint and associated symptoms
- Time, place, activity and circumstances of injury
- Treatment rendered prior to arrival
Ocular Examination

• Visual Acuity
  – Monocular assessment at distance or near
  – Check with correction in place i.e. glasses.
  – Depends on age.
  – Nonverbal patients
    • Blinks to light/Reacts to light: develops by GA 31 weeks
    • Fixation: develops by 2-3 mos gestational age.
    • Pictures: Allen chart
    • Letters: HOTV chart/matching, Snellen Chart, crowding bars.
Ocular Examination

• Alignment and Ocular Motility
  – Check Cranial Nerves III, IV, VI.
  – Gross Observation
  – Corneal light reflex testing
    • Hirschberg testing
  – Cover/Alternate cover testing
  – Doll’s head if necessary
Bruckner Testing

- Trans-Illumination testing to help diagnose small angle deviations and amblyopia.
- Uses the direct ophthalmoscope to illuminate both eyes.
  - Check red reflex
  - Check corneal light reflex
  - We use it to detect large refractive errors.
Ocular examination

- Ocular Examination
  - Pupils
    - Size, shape
    - Response to direct and consensual light
    - Check for a relative afferent pupillary defect.
  - Lids/Adnexa
    - Evaluate position of lid, contour, and periocular areas
    - Check for evidence of lesions and edema
  - Orbit
    - Inspect for symmetry and proptosis
    - Palpate the orbit for “step-offs”
Ocular examination

• Slit Lamp
  – Best for examination of anterior structures.
  – Conjunctiva, Cornea, Iris, Lens, Anterior Chamber.
Ocular Examinations

- Ocular Examination
  - Fluorescein Staining
    - Increased dye uptake indicative of damage to the corneal epithelial cells
    - Can help diagnose the following:
      - Corneal Abrasion
      - Chemical Injury
      - Herpetic Disease
      - Leaking wound
Ocular Examination

- Intraocular Pressure (IOP)
  - Applanation - Tonopen - Tactile
  - Schiotz tonometry - iCare.
Ocular Examination

- Funduscopic exam
  - For evaluation of the optic nerve, blood vessels and retina
The Non-ophthalmologist’s Eye Exam

- Vision (near, one eye at a time)
- External inspection
- Alignment / motility
- Pupil reactions to light
- Penlight or slit lamp exam
- Red reflex test (Bruckner test)
Eye Consult Timeline

Urgent – Surgical

- Open globes
- Intraocular foreign bodies

Urgent – Nonsurgical

- Severe chemical burns (but start irrigation at once!)
  - Hyphema, if total (“8-ball”) or painful
Eye Consult Timeline

Less urgent

- Corneal foreign bodies – no penetration
- Hyphema – partial, non-painful
- Anterior segment trauma
- Lens, iris
- Traumatic optic neuropathy
- Retinal trauma
- Most corneal abrasions

Non urgent

- Subconjunctival hemorrhage
- Clean, small corneal abrasions
Videos For Reference

Slit Lamp Exam Video: https://www.youtube.com/watch?v=7UH4HBKYeJc

Relative Afferent Pupillary Defect: https://www.youtube.com/watch?v=WrNYqNH3b3A
Pediatric Ophthalmic Infections/ Injuries

- Red Eye
  - Conjunctivitis
  - Keratitis
  - Corneal Abrasions

- Infectious Causes
  - Chalazion
  - Preseptal Cellulitis
  - Orbital Cellulitis

- Trauma
  - Traumatic Iritis
  - Hyphema
  - Corneal Foreign Body
  - Eyelid Lacerations
  - Orbital Fractures
  - Open Globe
The Red Eye

The “key” to the RED EYE:

- Is it infected?
- Is it inflamed
- Is it neoplastic
- Is it just irritated
- Is it something else ????????????
Red eye is a complex non-specific sign.
Causes of Red Eye

Conjunctivitis
- Viral
- Bacterial
- Allergic

Corneal abrasion

Blepharitis

Chalazion

Congenital glaucoma

Corneal infection

Trauma
- Foreign body reaction
- Hyphema
- Burns
- Chemical injury
- Open globe

Uveitis
- JIA

Orbital cellulitis

Steven-Johnson syndrome

Retinoblastoma
History

Unilateral vs bilateral

Symptoms

Onset/duration

Contact lens wear
Conjunctivitis

- **Inflammation** or infection of the membrane lining the eyelids

- **Age and presentation will dictate management**
  - Neonatal: gonorrhea, chlamydia, HSV
  - URI Symptoms: adenovirus
  - Purulent: bacterial
  - Allergic
Conjunctivitis

• Viral
  – Acute or subacute onset with usually an exposure history.
  – Minimal pain level.
  – Clear watery discharge, photophobia and itching
  – *Very contagious*
  – Treatment: Self limited, supportive care with artificial tears and cool compresses.

• Bacterial
  – Acute onset, with minimal pain.
  – Chemotic conjunctiva, copious thick and purulent discharge
  – Treat with antibiotic eye drops. i.e. Polytrim

• Allergic
  – Acute to subacute onset. May be seasonal
  – Hallmark of symptom is itching and a clear watery discharge.
  – Treat with antihistamine drops and mast cell stabilizers. i.e. Zaditor, Pataday
Adenoviral conjunctivitis

- Acute onset watery discharge, photophobia and a foreign body sensation.
- Usually will present around time of URI symptoms.
- Can have pre-auricular lymphadenopathy and a follicular conjunctivitis.
- Can have subconjunctival hemorrhage, moderate conjunctival chemosis and a pseudomembrane formation.
Treatment

• No antiviral treatment available
• Symptomatic relief – cool compresses, artificial tears.
• Strict Hand Hygiene to help prevent spread.
  – Make up needs to be thrown away
  – Bedding cleaned.
Kawasaki Disease (KD)

- Usually presents in children younger than 5, but cases of KD in adolescents and adults have been reported.
- Vasculitic disease affecting several organ systems.
- Concerning due to the possible development of coronary artery aneurysms (CAA).
Signs/Symptoms

Fever ≥ 5 days

4 out of the 5 symptoms:

- Bilateral bulbar conjunctival injection
- Oral mucous membrane changes (strawberry tongue, fissured lips)
- Peripheral extremity changes (periungual desquamation, edema of hands or feet, palmar/sole erythema)
- Polymorphous rash
- Cervical lymphadenopathy (≥ 1 node > 1.5 cm in diameter)
Eye Signs/Symptoms

• Bilateral nonexudative conjunctivitis which may spare the limbus

• Self-limited uveitis (anterior) may be present in 70% of patients
  – Useful when incomplete (atypical) KD
Texas Children’s Hospital Recommended Treatment

**Intravenous immune globulin (IVIG)**

- If given within 10 days can decrease the prevalence of coronary artery aneurysms by five-fold
- 2g/kg as a single infusion

**Aspirin**

- 50 mg/kg/day in 4 divided doses for first 14 days or until fever resolves
- Then reduce dose to 5mg/kg/day single dose
- Discontinue aspirin if follow up echo at 6-8 weeks shows absence of CAA
Keratitis

http://dro.hs.columbia.edu/marginalk.htm
Corneal Ulcers

• Infection of the corneal stroma.
• Typically occurs after disruption of the corneal epithelium.
  – Corneal Abrasions
  – Contact lens use.
• Always consult ophthalmology.
Marginal Keratitis

• Inflammation of the cornea usually due to blepharitis.
• Located near the limbus.
• Ask for history of recurrent symptoms, styes or chalazions
• Sx: eye redness, irritation, light sensitivity, foreign body sensation.
• Tx: Lid scrubs and warm compresses.
HSV Keratitis

• Primary HSV infection

• Patients may have a history of perioral cold sores- also ask for family members with a history of this.

• Can initially manifest as unilateral – can be recurrent, conjunctivitis. (Follicular)

• May have had a history of vesicles on eyelid as initial presentation.

• Treatment with trifluridine 1% drops or ganciclovir 0.05% ointment 5x/day. If poor compliance can also treat with PO Acyclovir 20mg/kg QID x 7 days.
HSV Keratitis
Corneal Abrasions

• Corneal epithelial defect

• Etiology
  – Trauma
  – Contact lens
  – Foreign body

• Photophobia

• Burning eye pain

• Blinking intensifies pain
Corneal Abrasion

• *If you see linear abrasions, suspect a foreign body under the eyelid.
Corneal abrasions

• Fluorescein staining.
• Evaluate for a foreign body.
• Send to PCP
• Treatment:
  – Antibiotic ophthalmic ointment
• Needs to be followed daily for pediatric population.
  – Why? If very large can cause amblyopia if not healed properly.
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  - Open Globe
Chalazion

- A localized bump on the eyelid due to blockage of one or more meibomian glands. (oil glands)
- This is different from a stye or a hordeolum which is a small abscess due to the glands getting infected.
HORDEOLUM
INFECTION OF THE GLANDS OF THE EYELID

INTERNAL MEIBOMIAN GLAND

EXTERNAL (STYE), GLAND OF ZRIS OR MOLL

NO! STAY BACK! IT HURTS!

REDNESS, ACUTELY TENDER

CHALAZION
STERILE, CHRONIC INFLAMMATION THAT RESULTS FROM A BLOCKED MEIBOMIAN GLAND

MAY DEVELOP FROM AN INTERNAL HORDEOLUM

DUDE, TAKE A CHALAZION PILL.

HARD, NOT TENDER

INTERNAL MEIBOMIAN GLAND

SEBACEOUS GLAND OF ZRIS

APOCRINE GLAND OF MOLL
Treatment

- Frequent warm compresses and lid scrubs help unclog the oil glands.
- Anti-inflammatory eye drops and ointments sometimes are needed.
- For long-standing chalazia, surgical drainage may be necessary.
Preseptal Cellulitis

- Inflammation and infection of the tissues anterior to the orbital septum.

- Swollen and erythematous lid, but the eye is white and motility is full.

- Three main routes
  - Direct inoculation with eyelid trauma i.e. insect bites.
  - Spread from contiguous structures
    - Paranasal sinuses i.e. ethmoid disease
    - Chalazia/Hordeoleum
    - Dacryocystitis
    - Impetigo
    - HSV
  - Hematogenous
Preseptal Cellulitis

• Treatment: Oral antibiotics

• If the patient does not respond to oral antibiotics in 48 hours or if suspecting orbital disease- IV antibiotics needed.

• CT scan if suspecting orbital cellulitis.
Orbital Cellulitis

- Infection of orbital contents posterior to the orbital septum
- Etiology:
  - Sinusitis
  - Dacryocystitis
  - Dacryoadenitis
  - Dental infections
  - Intracranial infections
  - Trauma
  - Postorbital surgery
Orbital Cellulitis

• Symptoms:
  – Decreased vision
  – Pain with eye movements
  – Diplopia

• Signs:
  – Fever
  – Lid erythema and edema
  – Proptosis
  – Motility restrictions
  – Relative afferent pupillary defect
  – Conjunctival injection
  – Optic nerve swelling
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Sports-related Injuries

100,000+

patients affected by sports-related injuries

40,000 of these patients account for eye injuries

13,500 can result in PERMANENT BLINDNESS

90% of these sports-related injuries can be PREVENTABLE
Serious Pediatric Eye Injuries

70% require major surgery

30% require 2 or more surgeries

25% result in monocular blindness

25% result in severe visual impairment in one eye
### What Activities Lead to Eye Injuries?

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball</td>
<td>26%</td>
</tr>
<tr>
<td>Other</td>
<td>21%</td>
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<tr>
<td>Fishing</td>
<td>12%</td>
</tr>
<tr>
<td>Darts</td>
<td>11%</td>
</tr>
<tr>
<td>Hunting</td>
<td>9%</td>
</tr>
<tr>
<td>Tennis</td>
<td>8%</td>
</tr>
<tr>
<td>Bicycling</td>
<td>7%</td>
</tr>
<tr>
<td>Football</td>
<td>6%</td>
</tr>
</tbody>
</table>

Most common types are either:
- Penetrating injuries
- Blunt injuries
- Radiation injuries

Air rifle, BB gun, Paintball, etc.
Eye Injuries from Trauma

Males are affected 9x more often than females

- Trauma is a leading cause of visual impairment; *usually* unilateral
- A unilaterally blind child is more likely to become blind in second eye compared to bilaterally sighted child
Pediatric Eye Injuries

- 90% of BB injuries
- 67% of fireworks injuries
- 46% of sports-related injuries
- 20% of MVA-related injuries
Traumatic Iritis: Inflammation of the Iris Following Trauma

- Pupil can be sluggish, dilated, irregular
- Photophobia
- Eye injected (ciliary flush, limbal flush)
- Slit lamp exam: cells in the anterior chamber
- R/O other ocular injuries
Hyphema: Blood in Anterior Chamber

- Due to rupture of iris vasculature
- Evaluate for other globe injuries
- Glaucoma risk
  - check eye pressure
  - Evaluate for sickle cell disease or trait.
- Risk of re-bleeding
- Place eye shield
- Consult ophthalmology ASAP
Corneal Foreign Bodies

- History of trauma or sudden onset foreign body sensation/pain.
- Commonly metal for adults, kids (anything)
- Symptoms similar to corneal abrasion.
- Need to rule out open globe.
- Assess depth via slit lamp
Corneal Foreign Bodies

• If no open globe.
• Treatment
  – Needs Removal by Ophthalmology
Eyelid Lacerations

• Usually due to dog bites, trauma.
• Determine if full vs. partial thickness.
• Determine if involving the lid margin or canaliculus.
• Evaluate for other ocular injury.
• Broad spectrum antibiotic coverage (If animal or human bite cover with Augmentin or Clindamycin)
• Need Tetanus prophylaxis.
Eyelid Lacerations

Always evaluate for possible globe injury.
Always, Always, Always
Canalicular Lacerations
Orbital Fractures

- Periorbital ecchymosis
- Periorbital edema
- Motility restrictions
  - Muscle entrapment
  - Orbital fat entrapment
  - Orbital edema
- Orbital rim “step-offs”
- CT of face and orbits
- Broad spectrum antibiotics
- Consult
  - Face Trauma Team
  - Ophthalmology

MECHANISM OF FRACTURE

- Force of blow ➔ backward displacement of eyeball ➔ intraorbital pressure increases ➔ fracture in the weakest point of orbital wall
Orbital Fractures

• Be Careful of a white quiet eye in an orbital fracture!
• Trap-Door Orbital Floor Fracture.
• Other signs of entrapment
  – Oculocardiac reflex: Patient’s will have nausea and have bradycardia when asked to look up.
  – Increased IOP when looking in the restricted gaze.
• Other emergencies: Roof Fractures
Open (Ruptured) Globe

Suspect if:

- Pupil “peaked” or irregular
- Extensive subconj. hemorrhage
- Decreased vision
- “8 ball” hyphema
- Soft / distorted eye
- Prolapse of ocular contents
Occult Open Globe

Suspect if:

- History consistent with open globe
- VA is markedly decreased
- Eye is soft
- Anterior chamber is shallow
- Pupil is peaked
Open Globe – Initial Rx

STAY CALM

• Place shield over eye
• Elevate head
• Pain and Nausea Control
• Avoid Valsava, pressure on globe, bending, lifting
• Check tetanus status
• Broad spectrum systemic antibiotics
• Imaging, R/O FB

NO TOPICAL MEDS
Open Globes

• Eye-shield placement: If you don’t have one- use a styrofoam cup.
• DO NOT use gauze.
Important Points

- Eye protection for childhood sports is important
- A pre-participation sports physical can be helpful in identifying patients who may be at increased risk
- Glasses and sunglasses are not enough protection. Safety Sports eyewear that conforms to the American Society for Testing and Materials Standard for selected sports is recommended
Resource: Vision Council’s Eye Safety At-a-Glance

<table>
<thead>
<tr>
<th>SPORT</th>
<th>Protection Needed</th>
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<tbody>
<tr>
<td>BADMINTON</td>
<td>Sports goggles</td>
</tr>
<tr>
<td>BASEBALL</td>
<td>Batting: Face guard attached to helmet</td>
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<tr>
<td></td>
<td>Fielding: Sports goggles</td>
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<tr>
<td>BASKETBALL</td>
<td>Sports goggles</td>
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<tr>
<td>CYCLING</td>
<td>Cycling eyewear</td>
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<tr>
<td>FENCING</td>
<td>Full face cage</td>
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<tr>
<td>FIELD HOCKEY</td>
<td>Goalie: Face mask</td>
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<tr>
<td></td>
<td>Others: Sports goggles</td>
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<tr>
<td>FOOTBALL</td>
<td>Face shield attached to helmet</td>
</tr>
<tr>
<td>HANDBALL</td>
<td>Sports goggles</td>
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<tr>
<td>ICE HOCKEY</td>
<td>Helmet with full face protection</td>
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<tr>
<td>LACROSSE (MALE)</td>
<td>Helmet and full face protection</td>
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<tr>
<td>LACROSSE (FEMALE)</td>
<td>Minimum: Sports goggles</td>
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<tr>
<td></td>
<td>Max: Helmet and full face protection</td>
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<tr>
<td>RACQUETBALL</td>
<td>Sports goggles</td>
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<tr>
<td>SOCCER</td>
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<td>SQUASH</td>
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<td></td>
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<tr>
<td>SWIMMING</td>
<td>Swim goggles recommended</td>
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<tr>
<td>TENNIS (DOUBLES)</td>
<td>Sports goggles</td>
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<tr>
<td>TENNIS (SINGLES)</td>
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<tr>
<td>WATER POLO</td>
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Questions/Comments?

Thank you for your attention!