

Pediatric Anterior Segment: What ODs Need to Know

Marie I. Bodack, OD, FAAO, FCOVD, Dipl BVPPO
Chief, Pediatric Primary Care @ Southern College of Optometry
mbodack@sco.edu

Nothing to Disclose

Course Goals

- To review commonly encountered pediatric anterior segment conditions and their treatment options.
- To become comfortable with FDA age guidelines and dosing for ophthalmic medications including orals
- To become comfortable in treating pediatric anterior segment disorders



Capillary Hemangioma

- Benign, Soft Tissue Tumor
 - Blood vessels
- Most common orbital tumor of childhood
- 1/200 births
- Gender
- Location
- Color
 - Blanch on pressure
 - May bleed spontaneously
 - Crying

Capillary Hemangioma

- 30% present at birth, 100% by 6 months
- Rapid growth in first 12 months
- Most spontaneously regress by age 5
 - 30% age 3
 - 60% age 4
 - 76% age 7

Capillary Hemangioma

- Concerns
 - Amblyopia 25-60%
 - Occlusion of visual axis by lid
 - Induced corneal astigmatism
 - PHACE Syndrome



Capillary Hemangioma - Treatment

- Correct refractive error
- Treat amblyopia
- Steroid injection
 - Regression in 2-4 weeks
- Oral Beta blocker (propranolol -1-2mg/kg/day)
 - Mechanism: vasoconstriction, reduction in pro-angiogenic signals
- Topical Beta Blocker
 - Timolol maleate 0.25% bid
- Surgical excision

Pope E et al, Topical Timolol Gel for Infantile Hemangiomas: A Pilot Study. Arch Dermatol. 2010;146(5):564-565.



www.aapos.org

Ptosis

- Unilateral or bilateral
 - Asymmetry
 - Symmetrical OU
 - Posture
- Causes
 - Congenital
 - Acquired
 - CNIII Palsy – paretic levator
 - Systemic
 - Myasthenia Gravis
 - Trauma
 - Mechanical
 - Chalazion/Hordeolum
 - Hemangioma

Congenital Ptosis

- Signs
 - Levator function
 - Upper eyelid fold
- Concerns
 - Amblyopia



Horner Syndrome

- Ptosis and miosis on affected side
 - Anisocoria greater in dim.
 - Anhydrosis
- Etiology: disruption of sympathetic nerve supply
- Congenital
 - Iris color
- Acquired
 - Neuroblastoma (children)
 - Pancoast tumor of lung (adults)

Neuroblastoma

- Most common extracranial solid tumor in infants/children
 - 8-10% childhood cancers
 - Overall incidence 14/100,000
- 85% < age 5
- Abdomen
 - Adrenal gland
 - Can metastasize

Ptosis Evaluation

- Observation
 - Upper lid fold
 - Frontalis to elevate
 - Chin up head position
- Assessment
 - Palpebral aperture
 - Pupils
 - Pearl: Direct ophthalmoscope



Ptosis - Treatment

- Congenital
 - Amblyopia
 - If vision deprivation or cosmetic concerns
 - Surgical correction
- Acquired – Rule Out
 - Myasthenia
 - Variable and worse when tired
 - Ice-pack test
 - 2 and 2
 - Neuroblastoma
 - Imaging (MRI abdomen)



Chalazion/Hordeolum Treatment

- Hot Compresses
 - Frequency?
 - Problems?
- Topical Medications

Steroid Antibiotic Combination

- **TobraDex** (Dexamethasone 0.1%, Tobramycin 0.3%)
 - Ages 2+
 - gtts (generic) and ung
- **TobraDex ST** (Dexamethasone 0.3%, Tobramycin 0.05%)
 - Ages 2+
- **Zylet** (Loteprednol 0.5%, Tobramycin 0.3%)
 - Blepharitis and lid inflammation 0-6 years
- **Maxitrol** (Dexamethasone 0.1%, Neomycin, Polymixin B)
 - Ages 2+
 - gtts and ung

Chalazion/Hordeolum Treatment

- Surgery?
 - Size
 - Duration
 - Risk of occlusion amblyopia
 - Concern from anesthesia
- Omega 3
 - Adult dose 2-1000 mg tid
 - Pediatric Availability
 - Chewable daily
- Oral Antibiotics?



Macal MS. The role of omega-3 dietary supplementation in blepharitis and meibomian gland dysfunction (an AOS thesis). Trans Am Ophthalmol Soc. 2008;106:336-56.

Oral Antibiotics

- **Erythromycin Ethylsuccinate (EES)**
 - 30-50mg/kg/day q 6 h
 - Formulations: 200/400 mg/5ml
- **Dicloxacillin**
 - 12.5-50mg/kg/day q 6 h
- **Amoxicillin**
 - 25-45mg/kg/day q12 h
 - 20-40 mg/kg/day q8h
 - Formulations: 125/200/250/400 mg/5ml
- **Tetracycline (Ages 8+)**
 - 250 mg qid



Preseptal Cellulitis

- Etiology
 - Lid/cutaneous infections
 - Hordeolum/Impetigo
 - HSV/HZV
 - URI/Sinusitis
- Differentials
 - Allergic
 - Adenovirus (16%)
- Work Up
- Treatment

Oral Antibiotics

- Amoxicillin, Clavulanate (Augmentin)
 - 20-40mg/kg/day q 8h
 - Formulations: 125/200/250/400mg/5ml
- Cephalexin (Keflex) – 1st gen
 - 25-50mg/kg/day q 6h
 - Formulations: 125/250/500 mg/5ml
- Cefaclor (Ceclor) – 2nd gen
 - 20-40mg/kg/day q 8h
 - Formulations: 125/187/250/375 mg/5ml
- Cefdinir (Omnicef) – 3rd gen
 - 7 mg/kg/day q 12 hr
 - Formulations: 125/250 mg/5ml
- Trimethoprim/Sulfamethaxole (Bactrim)* allergy
 - 8-12/40-60mg/kg/day q12h

Oral Antibiotics

- PCN Allergy
 - Cross-reactivity with cephalosporins



Clinical Review:
The Conclusions
 Although a myth persists that approximately 10% of patients with a history of penicillin allergy will have an allergic reaction if given a cephalosporin, the overall cross-reactivity rate is approximately 1% when using first-generation cephalosporins or cephalosporins with similar R1 side chains. However, a single study reported the prevalence of cross reactivity with cefadroxil as high as 27%. For penicillin-allergic patients, the use of third- or fourth-generation cephalosporins or cephalosporins with dissimilar side chains than the offending penicillin carries a negligible risk of cross allergy.

Apter AJ et al. Am J Med 2006;119: 354
 Campagna JD et al. J Emerg Med 2012;42:612

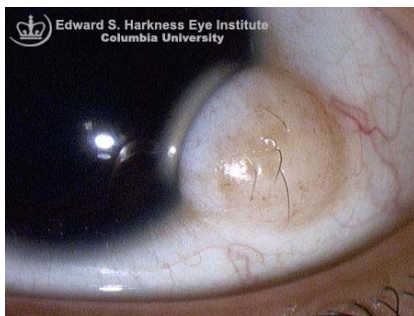
Dosing

- Follow FDA Guidelines
- Need to know
 - Child's weight in kg
 - Formulations of medication
- 1 tsp = 5ml



Example 5 y/o preseptal:

- 40 lbs = 18.14 kg
- Augmentin
 - 20-40mg/kg/day tid
 - Formulations 125/200/250/400mg for 5 ml
- Determine min and max mg/day
 - 362.8 to 725.6 mg/day
- Therefore :
 - Can do 125 (375 daily) or 200 (600 daily)
- On Rx:
 - Giving 5ml tid (15ml/day) for 10 days so dispense 150 ml



Edward S. Harkness Eye Institute
 Columbia University

Dermoid Cyst

- Choristomas
 - Benign tissue in abnormal location
- Congenital
- Location:
 - Conjunctiva = **Limbal dermoid**
 - Firm
 - Variable color
 - Lateral Canthus = **Dermolipoma**
 - Can be deeper
 - Ddx: prolapsed fat



Dermoid Cyst - Treatment

- Monitor
- Correct astigmatism
- Treat Amblyopia
- Oculoplastics for possible surgical excision?
 - Dermolipoma



Ocular Allergy – Antihistamines, Mast Cell Stabilizers, & Combination – OTC

- Ketotifen 0.025%
 - Zaditor
 - Alaway
 - Ages 3+
- Pataday
 - Once Daily (Pataday)
 - Twice Daily (Patanol)
 - Extra Strength (Pazeo)
 - Ages 2+



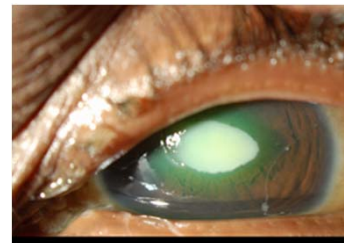
Antiallergy -Rx

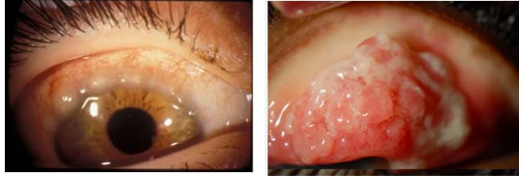
- Azelastine 0.05% (Optivar)
 - Ages 3+
- Epinastine 0.05% (Elestat)
- Bepotastine 1.5% (Bepreve)
- Alcaftadine 0.25% (Lastacaft)
 - Daily
- **Cetirizine 0.24% (Zerviate)**
- Cromolyn Sodium 4% (Crolom)
 - Ages 4+
 - 4-6 times/day
 - Vernal
- Lodoxamide 0.1% (Alomide)
 - 2-4 times a day up to 3 months
 - Vernal

Unless stated FDA approved for ages 2+ and bid

Antiallergy -Rx

- Loteprednol etabonate 0.2% (Alrex)
 - Safety information in pediatric patients has not been established
 - Dosing: qid





Vernal Conjunctivitis (VKC)

- Immunology
- Males > Females
- Age of Onset
- Symptoms
- Signs
 - Ropy mucus discharge
 - Injection
 - Lids
 - Cornea

Vernal Conjunctivitis - Treatment

- Cobblestone Papillae
 - Mast Cell Stabilizer
 - tid to qid
- Trantas Dots
 - Steroid
- Shield Ulcer
 - Antibiotic drops
- New!
 - Cyclosporine 0.1% (**Verkazia**)

Steroids

- Lotoprednol etabonate 0.2% (Alrex)
- Lotoprednol etabonate 0.5% (Lotemax)
 - Drops, ointment and gel
 - QID
- Fluomethalone 0.1% (FML)
- Fluomethalone 0.25% (FML Forte)
 - Ages 2+
 - bid to qid
- Prednisolone Acetate 1% (Pred Forte)
- Difluprednate (Durezol)

Unless stated, no safety information for pediatric patients



Ointments vs. Drops?

- Ointment:
 - Easier Installation
 - Longer lasting
 - Blurry vision
 - Better for infants
- Drops:
 - No blur
 - More options
 - May sting
 - Taste in mouth



Antibiotics - Ointments

- Erythromycin 0.5% (Ilotycin)
 - Neonatal prophylaxis
 - Up to 6 times/day
- Bacitracin (AK-Tracin, Bacticin)
 - Safety in peds not established
 - 1-3 times/day
- Tobramycin 0.3% (Tobrex)
 - 2+mos
 - 2-3 times/day
- Gentamicin 0.3% (Gentak)
 - Safety in neonates not established
 - 2-3 times/day
 - More toxic to cornea
- Ciprofloxacin 0.3% (Ciloxan)
 - 2+ years
 - tid x 2 days then bid x 5 days
- Sulfacetamide 10%, 15%

Antibiotics - Drops

- Polymyxin B+ Trimethoprim (Polytrim)
 - 2+mos
 - Dose q3h (6x day)
 - Stings
- Aminoglycosides
 - Tobramycin 0.3%
 - Gentamicin 0.3%
 - Sulfacetamide 10%, 15%

Antibiotic Drops - Fluroquinolones

- Ages (1+)
- Q2h x 2 days then qid x 5 days unless stated
- Ciprofloxacin 0.3% (Ciloxan)
- Ofloxacin 0.3% (Ocuflox)
- Gatifloxacin 0.3% (Zymar)
- Gatifloxacin 0.5% (Zymaxid)
- Moxifloxacin 0.5% (Vigamox)
 - tid x 7 days
- Moxifloxacin 0.5% (Moxeza) *4+mos
 - bid x 7 days
- Besifloxacin (Besivance)
 - tid x 7 days
- Resistance!
 - Alabadi CR, Miller D, Schiffman JC, Davis JL. Antimicrobial resistance profiles of ocular and nasal flora in patients undergoing intravitreal injections. Am J Ophthalmol. 2011 Dec;152(6):999-1004

Antibiotics–Azithromycin (AzaSite)

- FDA 1+ year old for bacterial conjunctivitis
- Unique dosing
- Off label use
 - Blepharoconjunctivitis
 - Lid margin hyperemic
 - Conjunctival inflammation/injection
 - Sub-epithelial infiltrates

Luchs. Clinical Ophthalmology 2010;4:681-8.



Viral Conjunctivitis

- 20% cases acute conjunctivitis (**adenovirus**)
- Types
 - Acute/Chronic
 - EKC
 - PCF
- Signs
 - Conjunctival injection
 - Tearing
 - Cornea
 - SEI
 - PAN



Viral Conjunctivitis – Evaluation & Treatment

- In office testing
 - Adenoplus
- Mild cases
- EKC
 - Subepithelial infiltrates
 - Steroid
- Povidone Iodine 5%?

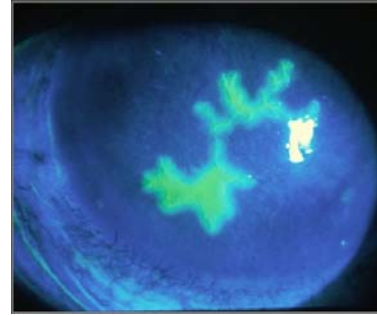


Photo by Emily Shull, OD, Cincinnati Eye Institute

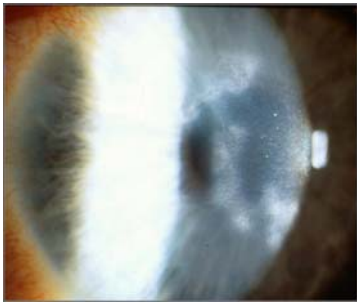


Photo by Emily Shull, OD, Cincinnati Eye Institute

Recurrent Red Eye

- 8 WF referred by PCP for evaluation of red eye
 - Saw PCP with 2 day hx of red eye
 - Rx ciprofloxacin ophthalmic qid
 - 3 days later increased redness, light sensitive, unable to open eye
 - Diagnosis and Treatment
 - Result?

Is HSV Different in Children?

- 48% of children - recurrence within 15 months
- 61% epithelial/stromal disease developed recurrent stromal disease
 - Epithelial disease only?
- Stromal scarring (48%)
 - Amblyopia
- 26% both eyes - concomitant or sequential
- Misdiagnosis

Chong et al. Am J Ophthalmol 2004; 138: 474-5
Liu et al. Ophthalmology 2012;119:2003

Is HSV Different in Children?

- Oral Acyclovir indicated
 - Greater inflammatory response
 - Effective for epithelial disease
 - Effective as prophylaxis for recurrences
 - Prevent infectious disease if on steroid for chronic stromal disease

Schwartz&Holland. Ophthalmology 2000: 107, p 278-282

HSV Treatment in Pediatrics

- Lid lesions: antibiotic ointment
- Corneal dendrites: antiviral
- Stromal disease: steroid
 - Taper PF to FML to Lotemax
 - Threshold dose
- Oral Acyclovir
 - tid when active then bid

Topical Antivirals

- Trifluorothymidine (Viroptic)
 - FDA ages 6+
 - Dosing: q2h up to 9 times/day
- Ganciclovir (Zirgan)
 - FDA ages 2+
 - Dosing 5 times/day until heals then tid for 7 days

Antivirals (oral)

- Acyclovir
 - Ages 2+
 - (10-20) to (40-80) mg/kg/day in 3 doses
 - Schwartz GS, Holland EJ. Ophthalmology 2000;107:278-282
 - Alternate dose all tid
 - 18 mos – 3 years: 200mg (5ml)
 - 3-5 years: 300mg (7.5ml)
 - 6+ years: 400mg (10ml)
 - Liu S, et al. Ophthalmology 2012;119:2003

Herpes and Amblyopia

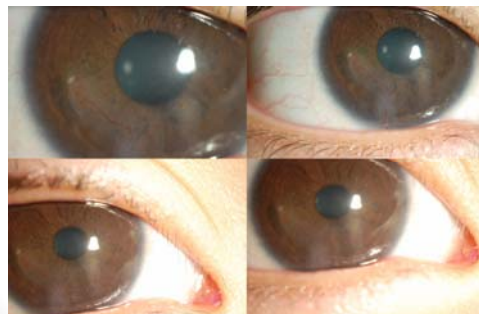
- Risk of corneal scarring/amblyopia
- Amblyopia Treatment
 - Correct refractive error
 - PATCH
 - Protective lenses

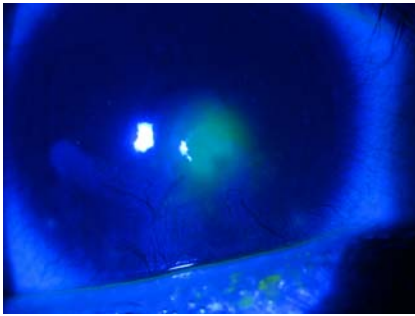


HSV Case Episode 2



- Key Point – You can get flare ups!





Phlyctenular Keratoconjunctivitis

- Bacterial hypersensitivity
 - *S. aureus*
 - *M. Tuberculosis*
- Signs
 - Single/multiple pinkish nodules 0.5-3 mm in diameter
- Treatment options
 - PPD?
 - Lid hygiene
 - Steroid c/s Antibiotic
 - Oral antibiotic
 - Cyclosporine

Doan S. et al. Topical cyclosporine A in severe steroid-dependent childhood phlyctenular keratoconjunctivitis. *Am J Ophthalmol* 2006;141:62-66

Dry Eye Treatments

- Loteprednol 0.25% (Eysuvis)
 - No safety information
- Cyclosporine 0.05% (Restasis)
 - No safety information < 16 years
- Cyclosporine 0.09% (Cequa)
 - No safety information < 18 years
- Lifitegrast (Xiidra)
 - No safety information < 17 years



Pediatric Ocular Rosacea

- Spectrum
 - Eyelid inflammation
 - Recurrent redness
 - Photophobia
 - Hordeola/Chalazia
 - Phlyctenules
- Lead to corneal neovascularization/scarring
- Delay in diagnosis > 1 year

Pediatric Ocular Rosacea

- Girls > Boys?
- Onset 3-7 years
- Positive family history (25%)
- Fair skinned European descent
- Clinically
 - Blepharitis
 - Recurren hordeola/chalazia
 - Telangiectasias
 - Dry eye
 - Keratitis/conjunctivitis
 - Phlyctenules up to 40%
 - Bilateral (75%)

Pediatric Ocular Rosacea

- Treatment
 - Warm compresses/lid hygiene
 - Tea Tree Oils
 - Azithromycin ophthalmic
 - Systemic antibiotics
 - Doxycycline 40-100mg daily or bid
 - Erythromycin 30-50mg/kg/day dosed tid
 - Azithromycin 10-12mg/kg/day 1 dose

Arriaga C. et al. Pediatric ocular rosacea, a misdiagnosed disease with high Morbidity: Proposed diagnostic criteria. World J. Derm 2016;5:109-14



Soetemen M et al. bmj. 2012

Sinusitis?

- 9 year old WM came to ER
- Noted small "blisters" around right eye for 5 days; HA and eye pain for 3 days
- Saw PCP yesterday
 - Amoxicillin for URI
- PMH: Vaccinations up to date, Prior infection at 11 months (?)
- Examination
 - Pustules on R forehead, not crossing midline, no nasal involvement
 - L/L: Vesicles on R upper lid
 - Conj: Grade 2 hyperemia

Diagnosis/Treatment

- HZV
- Rx:
 - Valtrex 250mg tid po x 14 days
 - Erythromycin ung tid
- Follow up in eye clinic in 3 days
- Exam
 - Not Eating
 - Cornea
- Follow ups 6 weeks
 - "Rage Fits"
 - Patient unaware of actions
 - Complains of HA
 - Side effect of Med?
 - Finished Valtrex 1 week ago

VZV

- Primary: Varicella (Chicken Pox)
 - Fever, Pruritic Rash peaks in 3 days
 - Location
 - Eye findings uncommon
 - Lid/conjunctival/corneal vesicles
- Vaccine
 - Monovalent
 - Quadravalent (MMRV)
 - 2 Doses



http://www.ehow.com/how_2172177_deal-chickenpox-discomfort.html

VZV

- Secondary: Zoster
 - Reactivation
 - Ophthalmic
 - Risks:
 - Increased age, poor nutrition, immune compromise, stress, fatigue
 - Lifetime risk 10-20%

Zoster in Children

- Uncommon
 - Incidence 0.45/1000 person yrs (0-14 yr old)
 - Incidence 10/1000 person yrs (>90 yr old)
 - Up to 9% rate in immunocompromised
- Predispositions in healthy
 - Primary maternal infection during pregnancy
 - History of varicella in 1st 12 months of life (not 2nd)
- Postherpetic Neuralgia
 - Resolves 1-3 months in 50%, 20% have 1 year later
 - “rarely seen in patients < 40 years”

Treatment for Pediatric VZV

- Pediatricians do not recommend use of acyclovir in healthy children <12
- Systemic acyclovir can decrease ocular complications if administered in 72 hours
 - Dose > 2 years <40 kg: 20mg/kg qid (max 3200mg)
 - >40kg 800 mg qid
- Steroids for cases with iritis, stromal disease
- Neuralgia?
- Work up?



Corneal Abrasion



- Etiology:
- History
- Exam pearl:
 - Work quickly
 - Get the information you need



INOVA Blue LED Micro Flashlight



Bluminator

Bear Hug



Corneal Abrasion Treatment

- Topical Antibiotics
- Pain medication (oral)
- Cycloplegic
- Bandage Contact Lens
- Fox Shield
- Follow Up
 - Daily



7 year old playing in a tree

- Local ER same day
 - Dx: Corneal abrasion
 - Rx: Polytrim qid
- ER 3 days later
 - Drainage
 - Swelling
 - Mom "removed twig"
 - Unable to open eye patient, mom, MD, RN
- Sent to Eye Clinic

Exam Under Anesthesia

- Tree Branch remnant in inferior fornix
- 2mm Ulcer 20% depth
- Treatment:
 - Ambisome 1% q 1h
 - Ceftazidime 50mg/ml q1h
 - Vancomycin 25 mg/ml q1h

Antifungal Drops

- Indication
 - Fungal infection
 - Organic matter
 - Non healing abrasion
- Natamycin 5%
 - Dose q1h for 1 day then taper
 - Duration 4-6 weeks
 - Safety in pediatric patients not established

Pearl

- You should be able to open the eyelid of a child with an abrasion. If you can't, further evaluation needed!





Uveitis Treatment

- Cycloplegia
- Topical Steroid
 - Aggressive to start
 - Taper
- Work Up
 - Blood tests
 - ANA
 - RF
 - HLA-B27
- Referral to rheumatology
- Systemic treatment
 - NSAIDs
 - Methotrexate
 - TNF inhibitors/Biologics
 - Adalimumab (Humira)
 - Abatacept (Orencia)
 - Etanercept (Enbrel)
 - Infliximab (Remicade)

Topical Steroids

- Prednisolone Acetate 1% (Pred Forte)
- Difluprednate
 - Effective for uveitis
 - 88% improvement in cells
 - 50% eyes, 50% patients:
 - IOP increase (≥ 10 mmHg & ≥ 24 mmHg)
 - 39% eyes, 43% patients
 - Cataract formation/progression

Slabaugh MA et al. Efficacy and Potential complications of difluprednate use For pediatric uveitis. Am J Ophthalmol 2012;153: 232-58

JIA Screening Recommendations 2019

- High risk screen every 3 months
- Topical Therapy
 - Tapering steroids be seen within 1 month
 - Stable be seen every 3 months
 - Prednisolone acetate 1% recommended over difluprednate
 - If prolonged topical may benefit from changes to systemic
- Systemic therapy
 - If changing should be seen within 2 months
 - If develop CAU first try/change topical therapy
- Systemic recommendations
 - Systemic MTX over oral
 - TNFI
 - Adalimumab and Infliximab

2019 American College of Rheumatology/Arthritis Foundation Guidelines for the Screening Monitoring, and Treatment of JIA -Associated Uveitis. Arthritis Care & Res. 2019;71:703-16

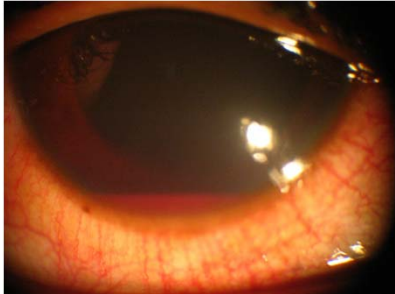
2019 Screening Recommendations

| Type | ANA | Age at Onset | Duration of Disease | Risk Category | Frequency of Eye Exam |
|---|-----|--------------|---------------------|-----------------|-----------------------|
| Oligoarthritis, polyarthritis (RF -), psoriatic, undifferentiated | + | <7 | AND ≤4 | High | 3 months |
| Oligoarthritis, polyarthritis (RF -), psoriatic, undifferentiated | - | ≥7 | OR >4 | Low or Moderate | 6-12 months |
| Systemic JIA, polyarthritis (RF -), enthesitis related arthritis | | | | Low or Moderate | 6-12 months |

Ocular Steroids

- Treat as you do in adult
 - Don't under treat!
- Monitor IOP
 - Steroid responders
 - If increase IOP add glaucoma drop (e.g. Timoptic 0.25% or 0.5%)
 - Contraindications
- Wean off





Lawnmower injury

- 12 y/o WM mowing lawn and injured OS
- Went to ER
- Dx: Corneal Abrasion, Hyphema, Borderline IOP



Lawnmower injury

- Initial treatment
 - PF q1h, Alphagan tid, Vigamox qid
- 3 days after injury
 - IOP 30
 - MD added Cosopt bid
- 5 days after injury
 - Presented with nausea, photophobia, malaise
 - IOP spike to 44
- Admit to hospital for IV Diamox
 - Vomiting
 - IOP still elevated

Traumatic Hyphema Exam

- | | |
|---|--|
| • VA | • IOP |
| • Cornea <ul style="list-style-type: none"> • Abrasion • Blood staining | • Retina <ul style="list-style-type: none"> • Hemorrhages • Commotio retinae |
| • AC <ul style="list-style-type: none"> • Cells | • B scan? |
| • Iris <ul style="list-style-type: none"> • Sphincter Tear | • Gonio? |
| • Lens <ul style="list-style-type: none"> • Cataract | |

Hyphema Treatment

- Bed rest!
 - Or Lazy Boy Chair
 - Head elevated 30deg
- No ASA or Ibuprofen
- Fox shield



Hyphema Treatment

- Cycloplegic
 - Atropine 1%
- Steroids
 - **Pred Forte**
 - q1h or q2h initially
 - Monitor IOP
 - Steroid responders v. Traumatic Glaucoma
 - If increase IOP (>26-30) taper and add glaucoma drop

Glaucoma Drugs

- Beta Blockers
 - Timolol maleate 0.25, 0.5% (Timoptic, Timoptic XE, Istalol)
 - Betaxolol 0.25% (Beoptic S)
 - “Safe for pediatric patients”
- Alpha Adrenergic Agonists
 - Brimonidine 0.2% (Alphagan/P)
 - Ages 2+
 - Extreme sleepiness (50-83%) ages 2-6, 25% 7+
- Carbonic Anhydrase Inhibitors
 - Brinzolamide 1% (Azopt)
 - Dorzolamide 2% (Trusopt)
 - “Safe in pediatric patients”

Glaucoma Drugs

- Prostaglandin analogs
 - Ages 16*
 - Brimatoprost 0.01/0.03% (Lumigan)*
 - Travaprost 0.004% (Travatan/Z)*
 - Tafluprost 0.0015% (Zioptan)*
 - Not recommended in pediatric patients
 - Latanoprost 0.005% (Xalatan)
 - No pediatric information
 - Latanoprostene 0.024% (Vyzulta)*
 - *Pigmentation changes

Glaucoma Combination Drugs

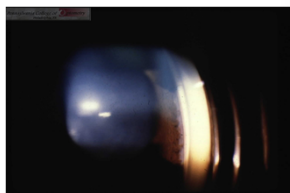
- Brimonidine 0.2%, Timolol 0.5% (Combigan)
 - Ages 2+
- Brinzolamide 1%, Brimonidine 0.2% (Simbrinza)
 - Ages 2+
- Dorzolamide 2%, Timolol 0.5% (Cosopt/PF)
 - Ages 2+

Glaucoma Drugs

- Rho Kinase Inhibitors
 - Netarsudil 0.02% (Rhopressa)
 - No safety information <18 years old
 - 53% conjunctival hyperemia
- Combo
 - Netarsudil 0.02% + Latanoprost 0.005% (Rocklatan)
 - No safety information

Hyphema Treatment

- Follow up
- Gonio
- If rebleed
 - R/O sickle cell
- Admit to hospital
 - Compliance
 - Vomiting
 - Rebleed
 - Systemic



Iris Lisch Nodules

- Discrete lesions on anterior iris surface
 - Color
 - Round
 - Bilateral
 - Varying size
- Associated with Neurofibromatosis I (NF1)

Lubs, NEJM, 1991;324:1264



Joseph Carey Merrick (August 1862 – April 1890)

Neurofibromatosis (NF1)

- Neurocutaneous disorder (Phakomatoses)
 - Von Recklinghausen's Disease
- Incidence: 1/3,000 people
- Genetics
 - AD but spontaneous mutations
- Other associations
 - Cognitive Impairment
 - Seizures
 - Hydrocephalus

Diagnostic Criteria NF-1

- 6+ café au lait macules > 5 mm pre-/15mm post pubertal
 - Flat, pigmented cutaneous lesions
- 2+ neurofibromas
 - Plexiform neurofibroma – S shaped upper eyelid
- Freckling in axillary or inguinal regions
- Distinct osseous lesion
- First degree relative with NF-1
- **Optic nerve glioma**
 - 15-19% with NF1
- **2+ iris Lisch nodules**

Neurofibromatosis 1 Treatment

- Selumetinib (Koselugo)
 - FDA 2020
 - Reduce the size of neurofibromas
 - Eye exam
 - Baseline and “regular intervals”
 - Blurred vision, cataracts, photophobia, ocular HTN in 15% pediatric patients
 - RPED, RVO
 - Cost!!!

Ophthalmic Assessment: Permanently discontinue Koselugo in patients with RVO. Withhold Koselugo in patients with RPED, follow up with optical coherence tomography assessments every 3 weeks until resolution, and resume Koselugo at a reduced dose. For other ocular toxicities, withhold, reduce dose, or permanently discontinue Koselugo based on severity of adverse reaction.



Pediatric Cataracts

- Opacities of crystalline lens
 - Size
 - Shape
 - Location
- Incidence
 - 3/10,000 (<1 year)
 - 4.5/10,000 (>1 year)
- Visual **development**



Pediatric Cataract

- | Bilateral | Unilateral |
|---|---|
| <ul style="list-style-type: none"> • Idiopathic (60%) • Systemic disease (30%) • Genetic, metabolic, systemic disease (5%) <ul style="list-style-type: none"> • Galactosemia, DS, DM, Lowe's syndrome • Maternal infection (3%) <ul style="list-style-type: none"> • Rubella (50%), CMV, Syphilis • Ocular anomalies (2%) <ul style="list-style-type: none"> • Aniridia, AS dysgenesis • Medications <ul style="list-style-type: none"> • Corticosteroids | <ul style="list-style-type: none"> • Idiopathic (80%) • Ocular anomalies (10%) • Traumatic (10%) <ul style="list-style-type: none"> • Presentation cortical to hypermature • Rule out abuse |

Pediatric Cataract - Evaluation

- VA & Slit lamp
- Unilateral
 - History and physical
 - TORCH Titers
- Bilateral cataracts
 - Urine for reducing substances - galactosemia
 - Urine for amino acids (Lowe's syndrome - glc, cat, dev delay)
 - VDRL & TORCH Titers
 - CBC
 - BUN
 - Calcium, Phosphorus - metabolic disorders

Pediatric Cataracts - Congenital

- Treatment
 - Visually significant (> 3mm, pupillary axis)
 - Removal by 2 months
 - Infant Aphakia Treatment Study (2010)
 - IOL v. CL
 - VA similar at 1 year
 - Second procedure
 - 12% CL group
 - 63% IOL
 - If 8+ years and no treatment: poor prognosis



Pediatric Cataracts - Acquired

- More conservative
- Reduced VA
 - Correct refractive error
 - Patching and dilate pupil for improvement
 - PEP 2.5%
 - Surgery?

Pediatric Cataract Treatment

- Post-surgery
 - Monitor VA
 - Amblyopia treatment especially if unilateral
 - Monitor for glaucoma
 - Due to cataract?
 - Due to surgery technique?
 - Due to genetics?

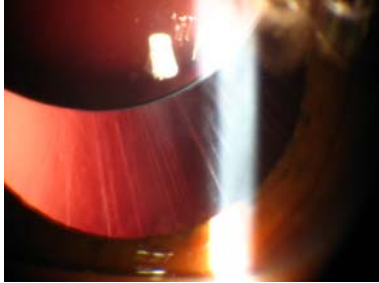


Photo courtesy of Daniele Saltarelli, OD

Ectopia Lentis

- Due to disorders that disrupt the microfibrils of the zonules
 - Marfan's Disorder
 - Homocystinuria
 - AR
 - Methionine catabolism
- Usually zonules remain attached, but can detach
- Signs:
 - Lens dislocation (dilated exam)
 - Reduced VA

Marfan's Syndrome

- Mutations in gene for fibrillin-1 (FBN1)
- Systemic
 - Tall stature
 - Aortic root dilatation
 - Mitral valve prolapse
- Complications: cardiac
- Criteria:
 - Myopia >-3.00
 - Ectopia lentis (non-progressive)
 - Family history
 - (+) Genetic testing
- Treatment



Ectopia Lentis - Treatment

- Appropriate MD referral if no prior diagnosis
- Protective glasses
- No contact sports if severe subluxation
- Accurate refraction
- Referral for surgery if poor VA due to subluxation
 - VA 20/60 or worse
 - Monocular diplopia
 - Lenticular prolapse
 - Average age 10.2 years

Surgical management of lens subluxation in Marfan syndrome, JAAPOS 2014;18:140-6.

Summary

- Get the information you need
- Kids can have same problems as adults
- Sometimes eye findings indicate a systemic disease
- Thank You

