Positive Reinforcement

Cycloplegia: Which Kids?
- All strabismic / amblyopic kids
  - Initial eye exam at your office

Subsequent exams
- Suspect malingering
- Need confirmation of refractive error
- Things don’t make sense

Cycloplegic Refraction: Drop Regimen
- Topical anesthetic (usually)
- 2 gtts cyclopentolate
  - 1% for children ≥1 year
  - 0.5% for children <1 year
- Phenylephrine or tropicamide for mydriasis
- Wait 30 minutes

Tropicamide: Residual Accommodation

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Residual Accommodation</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 9</td>
<td>6.25 D</td>
</tr>
<tr>
<td>10 - &lt;15</td>
<td>3.25 D</td>
</tr>
<tr>
<td>15 - &lt;20</td>
<td>3.20 D</td>
</tr>
<tr>
<td>20 - &lt;30</td>
<td>3.10 D</td>
</tr>
<tr>
<td>30 - &lt;40</td>
<td>2.60 D</td>
</tr>
</tbody>
</table>
Timing of Cycloplegia

How Do I Get Drops in Kids Eyes???

- Remain calm
- Child in supine position
- Instillation strategies
  - Use flavored drops
  - Describe feeling of drops
  - Drop on patient’s hand
  - Counting to 10
  - Closed eyes
  - Enlist another

Excessive Blinking

- Bilateral (90%)
- 6 months to 13 years; 2:1 Boys
- Intermittent (80%) vs. Constant
- Characterized by
  - Excessive rate – 46%
  - Excessive duration & force – 16%
  - Both – 37%
- Child complained to parents (29%)

Excessive Blinking - Rule Out

- Anterior segment or eyelid disorder
- Uncorrected refractive error
- Intermittent strabismus / high phoria
- Routine neurologic & neuroimaging not indicated for isolated excessive blinking*
- Habit tic - management
  - RTO: if redness, light sensitivity, or other associated eye symptoms develop

Bilateral Blinking in 89 Children

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th># Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habit tic</td>
<td>21</td>
</tr>
<tr>
<td>Uncorrected refractive error</td>
<td>14</td>
</tr>
<tr>
<td>Conjunctivitis</td>
<td>14</td>
</tr>
<tr>
<td>Psychogenic</td>
<td>10</td>
</tr>
<tr>
<td>IKT or exophoria</td>
<td>10</td>
</tr>
<tr>
<td>Keratitis</td>
<td>5</td>
</tr>
<tr>
<td>Dry eyes</td>
<td>5</td>
</tr>
<tr>
<td>CNS disease</td>
<td>4</td>
</tr>
<tr>
<td>Lid abnormalities</td>
<td>3</td>
</tr>
<tr>
<td>Tourette syndrome</td>
<td>1</td>
</tr>
<tr>
<td>Unclassified</td>
<td>2</td>
</tr>
</tbody>
</table>

Childhood Blinking N=34

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th># Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>23 boys &amp; 11 girls</td>
</tr>
<tr>
<td>Age</td>
<td>1.5 to 7.7 Years (mean 4.5)</td>
</tr>
<tr>
<td>Associated Symptoms</td>
<td>Eye rolling, eye lid squeezing, facial grimacing</td>
</tr>
<tr>
<td>Ocular Pathology</td>
<td>None = 91%</td>
</tr>
<tr>
<td></td>
<td>1 each: blepharitis, myopia, allergic conjunctivitis</td>
</tr>
</tbody>
</table>
Chemical Blinking

Follow-up With Parents

- Allergies - 2
- Needed glasses - 1
- Side effects stimulant meds for ADHD - 2
- Tourette’s diagnosis - 2
- Complete resolution = 71%

Accommodative Esotropia

- Refractive (normal AC/A)
- Non-refractive (high AC/A)
- Combined

Accommodative Esotropia

<table>
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<tr>
<th>Angle</th>
<th>AC/A Ratio</th>
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<tbody>
<tr>
<td>Distance = Near</td>
<td>= IPD (cm); normal</td>
</tr>
<tr>
<td>More eso at near</td>
<td>&gt; IPD (cm); high</td>
</tr>
<tr>
<td>Less eso at near</td>
<td>&lt; IPD (cm); low</td>
</tr>
</tbody>
</table>

Risk of Esotropia
Associated with Bilateral Hyperopia

<table>
<thead>
<tr>
<th>Bilateral SE Hyperopia</th>
<th>Odds Ratio*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.00 to &lt;+1.00 D</td>
<td>reference</td>
<td></td>
</tr>
<tr>
<td>+1.00 to &lt;+2.00 D</td>
<td>1.91</td>
<td>0.71 - 4.94</td>
</tr>
<tr>
<td>+2.00 to &lt;+3.00 D</td>
<td>3.23</td>
<td>1.36 - 7.55</td>
</tr>
<tr>
<td>+3.00 to &lt;+4.00 D</td>
<td>10.62</td>
<td>3.77 - 30.30</td>
</tr>
<tr>
<td>+4.00 to &lt;+5.00 D</td>
<td>23.24</td>
<td>8.66 - 63.36</td>
</tr>
<tr>
<td>≥ +5.00 D</td>
<td>122.24</td>
<td>48.86 - 301.52</td>
</tr>
</tbody>
</table>

*The model was stepwise logistic regression models adjusted for age, race, maternal smoking, gestational age.

Accommodative ET: Characteristics

- Ave onset = 2 to 3 yrs (4mo - 7 yrs)
- Onset gradual/intermittent; †frequency / duration
- ≥20-40Δ; varies w/accommodation & physical state
- Sometimes near angle > far angle
- Sx: diplopia, asthenopia, closing eye, none
- Initially no sensory adaptations

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Near Target & Instructions

Stress Clarity

Diagnosis of Accommodative ET

- Characteristic onset
- Hyperopia +/- or high AC/A
- Response to lenses****
- Follow-up is important

Accommodative ET: Treatment is Lenses

- Non-surgical case
- Consider full cyclo Rx (esp. if constant)
- Consider add at near (if high AC/A)

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Case Examples of Accommodative ET

Pseudoesotropia

- 10-19% later diagnosed with esotropia
- Serial examinations & parent education recommended

Parent Education - Tips

- The glasses seem to have made the ET worse!
- Will the glasses fix the ET?
- Should s/he have surgery?
- Will s/he always have to wear glasses?
- How about moderate / high hyperopes without ET?
**Amblyopia Diagnosis**

- Unilateral (sometimes bilateral)
- BCVA worse than 20/20
- No structural or pathologic anomalies... AND...

  1. Following occurring before age 6yrs:
     - Constant unilateral strabismus
     - Amblyogenic anisometropia
     - Amblyogenic bilateral isoametropia
     - Amblyogenic uni/bil astigmatism
     - Image degradation

  Amblyogenic factor must be there (essentially) all the time!

**Potentially Amblyogenic Refractive Error**

<table>
<thead>
<tr>
<th>Anisometropia (D)</th>
<th>Isoametropia (D)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1.00</td>
<td>≥ 4.00</td>
</tr>
<tr>
<td>≥ 3.00</td>
<td>≥ 6.00</td>
</tr>
<tr>
<td>≥ 1.50</td>
<td>≥ 2.50</td>
</tr>
</tbody>
</table>

* 20/25 – 20/60 range

**Deprivation Amblyopia**

- Physical obstruction along line of sight - prevents formation of well-focused, high contrast image on retina(s):
  - Congenital /infantile cataract
  - Other media opacities
  - Significant ptosis
  - Prolonged occlusion

**Amblyogenic??**

- Constant alternating ET 25∆ D/N
- CRXT 20∆ at distance; IRXT 20∆ at near
- CRET 15∆ at distance; CLET 15∆ at near
- CRET 3∆ at distance and near

**Amblyogenic??**

- PL -2.00 X 180 OD/OS
- OD: +1.50; OS: -2.00D
- OD: Plano; OS: +4.50D

**Key Point**

Amblyopia is NOT only a diagnosis of exclusion!!
Speaking of Amblyopia

Stephanie (10 yrs) History

- OD referral - cause of recently discovered ↓ VA LE at first eye exam?
- Parents/child unaware; passed school screenings
- OD sent for neurological eval & MRI - unremarkable
- Patient/family medical/eye history - unremarkable

Stephanie: Clinical Findings

- VA sc: RE: 20/20 LE: 20/100
- CT: Orthophoria D/N
- Stereopsis (Titmus): nil
- Color vision: normal
- Cycloplegic retinoscopy:
  - +0.25 DS (20/20)
  - –2.50 – 0.75 x 180 (20/100+1) PHNI
- Eye Health: unremarkable

Patient Profile

- Unilateral decrease in BCVA
- No organic cause
- No apparent strabismus
- No history of previous strabismus
- No history of significant anisometropia

Diagnosis?

Diagnostic Strategy

- First, rule out:
  - Refractive error
  - Ocular pathology
- Then, evaluate the following:
  - Eye alignment
  - Monocular fixation
  - Visuoscopy

Visuoscopy: OS Covered

Central Fixation
Microtropia with Identity

- No movement on unilateral cover test
- HARC
- Amblyopia
- Eccentric fixation
- $<EF = <D = <A$
- Peripheral fusion w/ amplitudes & gross stereo usually present

Helveston & von Noorden, 1967

LD vs. RD Stereopsis

Lateral disparity
- Fusion of a single line contour
- Disadvantage - monocular cues
- Titmus, circles & animal portion of Randot

Random dot
- Fusion of multiple contours
- No monocular cues
- Usually unfamiliar to patient
- Relies on bifixation & bifoveal fusion

RDS Stereotests

Diagnostic Strategy

- First, rule out:
  - Refractive error
  - Ocular pathology
- Then, evaluate the following sequentially:
  - Stereopsis
  - Eye alignment
  - Monocular fixation
  - Correspondence
  - Second degree sensory fusion?
**4Δ BO Test**

- Does NOT diagnose microtropia
- Diagnoses central suppression only!!
- Many atypical responses (normals & abnormals)
- Poor repeatability

![Diagram of eye with arrows indicating muscle movement](image)


**Small-Angle or Micro-tropia**

- Microtropia: ≤10Δ
- Microtropia with identity: Unique form where \( D \leq EF < A \)

**Monofixation Syndrome**

- Describes picture of characteristics commonly found in small-angle ET, especially as post-op outcome of surgery for infantile ET

**In Summary**

Patient with Unilateral VA Decrease of Unknown Cause

Check for a Microtropia!

_May save patient from costly & unnecessary testing_

**Prognosis: Long-term**

[Additional text and image about prognosis]

**Questions??**

scotter@ketchum.edu