Diagnosis and Management of the Pediatric Patient

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Diagnosis and Management of the Pediatric Patient

Pediatric Refractive Error
Amblyopia
Strabismus
Pathology
Prescribing for Preverbal Children

**Issues to consider:**
- Age
- Visual Function
- Refractive Error Norms
- Amblyogenic Risk Factors
- Birth History
- Family History
- Developmental History
Refractive Error Norms

- Highest rate of emmetropization – 1st 12-17 months

Hyperopia

- Average refractive error in infants = +2 D

- > 1.50 diopters hyperopia at 5 years old – often remain hyperopic
Refractive Error Norms

**Myopia**

25% of infants are myopic

Myopic Newborns (Scharf)

@ 7 years 54% still myopic
@ 7 years 46% emmetropic
@ 7 years no hyperopia
Refractive Error Norms

Astigmatism

- Against the rule astigmatism more prevalent switches to with-the-rule with development
- At 3 1/2 years old astigmatism is at adult levels
Case Example

22 month old Hispanic Male
22 month old Hispanic Male
3 Visits/ First at 14 months

- Spina bifida w/ hydrocephalus
- Significant Developmental Delay
  - (+) OT/PT/Speech/Developmental Therapy
- Asthma
- No visual complaints
- VA: F&F OD, OS
- NCT: Orthophoria
22 month old Hispanic Male

- Cycloplegic Retinoscopy:
  - 14 months old
    - +5.00 – 3.50 x 180 OU
  - 18 months old
    - +4.00 – 2.00 x 180 OU
  - 22 months old
    - +4.00 -2.00 x 180 OU
22 month old Hispanic Male

- **Assessment/Plan**

  - Hyperopic Astigmatism OU
  
  - Above age appropriate
  - Significant developmental delays
  - Rx given = +3.00 -1.50 x 180 OU
  - Follow-up 3-4 months
Prescribing for Preverbal Children

**Issues to consider:**

- Age
- Visual Function
- Refractive Error Norms
- *Amblyogenic Risk Factors*
- Birth History
- Family History
- Developmental History
DEFINITION OF FUNCTIONAL AMBLYOPIA

- Unilateral (infrequently bilateral) condition
- BVA < 20/20
- No structural or pathologic anomalies
- ≥1 of the following occurring before age 6:
  - Amblyogenic anisometropia
  - Constant unilateral strabismus
  - Amblyogenic bilateral isometropia
  - Amblyogenic uni / bi astigmatism
  - Image degradation
## POTENTIALLY AMBLYOGENIC REFRACTIVE ERRORS

### ISOMETROPIA
- Astigmatism: $> 2.50$ D
- Hyperopia: $> +5.00$ D
- Myopia: $> -8.00$ D

### ANISOMETROPIA
- Astigmatism: $> 1.50$ D
- Hyperopia: $> +1.50$ D
- Myopia: $> -3.00$ D
Amblyopia Treatment

PEDIG studies simplified
PEDIG Studies

- **ATS – 5** (3-7 y.o.) (18 week time course)
  - RX correction (no occlusion tx) for *anisometropic* amblyopes
    - Mean improvement = 3 lines
    - Moderate and severe amblyopia (20/40-20/250)
  - Rx correction (no occlusion tx) for *strabismic* amblyopes (or combined mechanism)
    - 74% improved ≥ 2 lines, 54% ≥ 3 lines, 32% resolved
    - Type of strabismus was irrelevant
Follow up treatment for Optical Treatment of Amblyopia

- 4-8 week intervals
- Some patients may not need occlusion
- Attempt one treatment at a time
- Allow for a total of 16-18 weeks to monitor improvement
Case Example

7 y.o. African American male
Case
7 yo male

- Cc: blur at distance and near

- DVA: 20/60 OD  20/20 OS
- NVA: 20/50 OD  20/20 OS

- CT: ortho

- **Cycloplegic retinoscopy**
  - +2.50 -3.50 x 180 OD
  - +2.00 -1.50 x 180 OS

- **Trial Frame**
  - +1.00 -3.00 x180 OU  D:20/40  N:20/40
  - +0.50 -1.00 x180 OU  D:20/20  N:20/20

- **Stereo testing (cc)**
  - (+) RDS
  - (+) Stereo Fly
Assessment / Plan
Assessment / Plan

- **Assessment**
  - Anisometropic Amblyopia
  - Hyperopia OU
  - Astigmatism OD>OS (no previous Rx hx)

- **Plan**
  - Rx given
    - +1.00 -3.00 x 180 OD
    - +0.50 -1.00 x 180 OS
  - RTC 1 month after Rx dispense
1 month after wearing Rx

- FTW Rx, very comfortable
  - +1.00 -3.00 x 180 OD
  - +0.50 -1.00 x 180 OS

- DVA cc  20/20 OD    20/20 OS
- NVA cc  20/20 OD    20/20 OU

- Stereo (+) Forms
- NCT – ortho, DCT – ortho
Case Example

5 y.o. Caucasian male
Case
5 yo male

- 5 yo male, Failed school screening

- **VA**
  - 20/25
  - 20/400
  - 20/300
  - 20/200

- **Cover Test**
  - Ortho???

- **Stereo**
  - (-) Fly, (-) forms
**Case**

5 yo male

- **Retinoscopy**
  - +8.00 -2.50 x 180
  - +10.00 - 2.50 x 045

- **Cycloplegic ret**
  - +8.50 -2.00 x 180  20/60 (20/30 w/ -1.00)
  - +10.00 -2.50 x 045  20/300

- **DFE**
  - C/D 0.2 Rd, wnl
Case
5 yo male
Assessment / Plan

- Likely strabismic amblyopia (vs. anisometropic)
- Rx given
  - OD  +7.00 -2.00 x 180
  - OS  +8.50 -2.50 x 045
- Occlusion therapy OD x 6 hours daily begin once Rx is received
- RTC 6 weeks
Case
5 yo male
3 month FU

- VA
  - 20/30  20/30
  - 20/60  20/60

- Stereo
  - (-) Fly, (-) RDS
  - W 4 Dot
    - Near = 4 dots
    - Distance = LE Suppression

- Cover Test
  - 6Δ CLET, 6Δ CLET’
Case
5 yo male
4 month FU

- VA
  - 20/20  20/20
  - 20/40  20/40

- Stereo
  - (-) Fly, (-) RDS
  - W 4 Dot
    - Near = 4 dots
    - Dist = LE Suppression

- Cover Test
  - 6Δ CLET, 6Δ CLET’
PEDIG Studies

- **Occlusion Dosage results**
  - 2 hours vs. 6 Hours = No difference
    - moderate amblyopes
  - 6 hours vs. Full time = No difference
    - Severe amblyopes
  - ≥ 6 hours occlusion vs. daily Atropine
    - Similar results
    - 2-3 lines of VA improvement
PEDIG Studies

- **Atropine vs. Occlusion (3-7 y.o.)**
  - Same results
  - Tx effect similar to 2 and 6 hours of occlusion
  - 80% reach max improvement by 4 months
    - 50% ≥ 20/25 by 4 months
    - may take up to 10 months

- **Atropine Installation: Daily vs weekend**
  - Same results
  - Both revealed 2.3 lines of improved VA in moderate amblyopia

- **Can Atropine be used for severe amblyopia (20/125-20/400)**
  - **Atropine only** = 21% mean VA ≥ 20/40, 4% mean VA ≥ 20/25
  - **Atropine + plano lens** = 39% mean VA ≥ 20/40, 13% mean VA ≥ 20/25
Case Example

4 y.o African American Male Twins
4 year old twins

Case History

- Premature
  - 2lbs, 2 ounces each
  - Born at 24 weeks
  - 2 weeks in NICU, no report of ROP
- No developmental delay is reported
- Mom notes difficulty with distance vision and a close working distance in both kids
- Mom notes eye turn out in Twin #1 only
- Have had previous exams and school screenings with no treatment recommendations
**Twin #1**

- **Visual acuity** – 20/60 OU, poor response to occlusion
- **EOM** – FROM OD, OS
- Cover Test– 20Δ RX(T), 20Δ RX(T)’
- Lang Stereopsis = poor response
- **Retinoscopy** ~
  - -7.50 -1.00 x 180 OD
  - -3.00 -0.50 x 180 OS
- **Ocular Health evaluation** = normal
Assessment / Plan
Twin #1

Assessment
- Anisometropic Amblyopia likely OD
- Anisometropic Myopia OD >> OS
- Intermittent Exotropia OD

Plan
- Rx given
  - -6.50 -1.00 x 180 OD
  - -3.00 -0.50 x 180 OS
- RTC 1 month after Rx dispense
  - Repeat VA OD, OS, stereo, Re-evaluate CT cc, determine need for occlusion tx
Twin #2

- **Visual acuity** – 20/70 OU, poor response to occlusion
- **EOM** – FROM OD, OS
- Cover Test – ortho, no strabismus noted
- Lang Stereopsis = poor response
- **Retinoscopy** ~
  - -8.00 D sphere
  - -8.00 D Sphere
- **Ocular Health evaluation** = normal
Assessment / Plan
Twin #2

☐ Assessment
- Isometropic Amblyopia possible
- High Myopia OU

☐ Plan
- Rx given
  - -7.00 D
  - -7.00 D

- RTC 1 month after Rx dispense
  - Repeat VA OD, OS, stereo, Re-evaluate CT sc and cc
Case Example

11 month old Hispanic Male
Astigmatism – Case Example

- **Age** = 11 month old hispanic male

- **Systemic History**
  - Microcephaly
    - Microcephaly is a medical condition in which the circumference of the head is smaller than normal because the brain has not developed properly or has stopped growing. Microcephaly can be present at birth or it may develop in the first few years of life.
  - Seizure disorder
    - Kepra d/c at 12 months
  - Developmental delay
    - (+)OT and (+)PT
Astigmatism – Case Example
Visit #1, 11 month old male

- **Visual acuity** – fixate and follow OD, OS
- **EOM** – FROM OD, OS
- **Kappa / Hirschberg** – ortho, no X(T) noted with prolonged dissociation
- **Bruckner** = (+) Bifixation
- **Cycloplegic Retinoscopy** ~
  - plano -5.00 x 180 OD, OS
- **Ocular Health evaluation** = normal
Astigmatism – Case Example
Visit #2, 14 month old male (3 month FU)

- Visual acuity – fixate and follow OD, OS
- EOM – FROM OD, OS
- Kappa / Hirschberg – ortho, no X(T) noted with prolonged dissociation
- Bruckner = (+) Bifixation
- Cycloplegic Retinoscopy ~
  - plano -4.50 x 180 OD, OS
- Ocular Health evaluation = normal
Astigmatism – Case Example
Visit #3, 17 month old male, 3 month FU

- **Visual acuity** – fixate and follow OD, OS
- **EOM** – FROM OD, OS
- **Kappa / Hirschberg** – 30Δ X(T)
  - Only noted with prolonged dissociation
  - Low frequency, good fusion
- **Cycloplegic Retinoscopy** ~
  - plano -4.50 x 180 OD, OS
- **Rx given**
  - plano -3.50 x 180 OD, OS
**Astigmatism – Case Example**

Visit #4, 19 month old male (2 month FU with RX)

- **Per Mom:**
  - “loves Rx, does not take them off, more alert and active”

- **Kappa / Hirschberg** – 20Δ X(T)
  - Only noted with prolonged dissociation
  - Very low frequency, good fusion

- RTC 4 months
Bilateral Spherical Refractive Astigmatism

Prescribing Guidelines

Research
- Large amounts common < 3 years of age
- born with > 2D
- 1D by 3 years of age

Management
- Do not correct before 1 year, but monitor frequently < 3 years
- Prescribe when
  - Child $\geq$ 3 years of age
  - Magnitude $> 1.25$ D
  - Stable over 3 visits

Amblyopia Risks
- Isometropic Amblyopia risk @ $> 2.50$ D
Intermittent Exotropia
Studies evaluating IXT Treatment Options

- Treatment options in intermittent exotropia: a critical appraisal (Optom Vis Sci 1992 May;69(5):386-404)
  - Review of clinical literature
  - Over minus Lens Therapy: 28%
  - Prism Therapy: 28%
  - Occlusion therapy: 37%
  - EOM surgery: 46%
  - Orthoptic vision therapy: 59%
Studies evaluating Overminus Lens Tx for IXT


- **Goal of tx**: secure ↑ in quality of fusion
- 35 children -2D - - 4D x 18 mo.

- 46% improved quality of fusion during therapy
- 26% improved quality of fusion and quantitative decrease in angle of deviation
- 28% inadequate improvement in quality of fusion or decrease in angle size
Studies evaluating Overminus Lens Tx for IXT

- Refractive Error Changes in children with intermittent exotropia under overminus lens therapy (Arq Bras Oftalmol. 2009 Nov-Dec;72(6):751-4)

**Goal of study:** Does ↑ accommodation (used with ↑ accommodative convergence) increase myopia?

- Record review

**Conclusion:**
- Treatment of IXT did not induce refractive error changes, even considering age, treatment period, initial spherical equivalent and overcorrection magnitude used
Detecting Strabismus

In young patients
Hirschberg/ Kappa Evaluation
Information gathered

direction of strabismus = exotropia
Laterality = alternating
estimation of magnitude $\sim 25 \Delta$
estimation of frequency = intermittent
**HIRSHBERG / KAPPA TESTS**

*Information gathered*

direction of strabismus = *esotropia*
Laterality = *alternating*
estimation of magnitude $\sim 40 \Delta$ (variable)
estimation of frequency = *constant*
Krimsky Evaluation
Case Example

Strabismus
20 month old Hispanic Female
20 month old Hispanic Female

- Normal birth and development hx
- Unremarkable medical hx
- c/o eye turn in since shortly after birth

- VA: F&F OD, OS

- EOM: 1+ OAIO OD, OS

- NCT: 35 △ AET’
  - NCT w/ +2.00 D: 35 △ AET’
2 year old Hispanic Female

- **Cyclo:**
  - OD : +1.00 -1.00 x 160
  - OS : +1.50 sph

- **A/P**
  - Infantile Esotropia
    - Constant
    - No amblyogenic risk
    - Surgical referral
Hyperopia with Esotropia

• Infantile / Congenital Esotropia

• Clinical Characteristics
  • Onset 6-12 months
  • Constant, large angle (30-60∆)
  • Refractive error = normal range
Hyperopia with Esotropia

- **Amblyopia Risk Factors involving Strabismus**
  
  - *Strabismic Amblyopia*
    - Unilateral Strabismus
    - Constant Strabismus
    - Present at Distance and Near Fixation
    - Present in All Fields of Gaze
  
  - Must be present **BEFORE** 6 years of age...
Case Example

*Strabismus*

3 year old Female
Hyperopia with Esotropia/ 3 year old female

**Case History**
- Mom c/o eye crossing when child concentrates on something x 2-3 months
- No significant family ocular history

**VA** (sc) 20/25 OD, OS

**Cover Test** (sc) 10 Δ E’ (initially)

**Stereopsis** (+) Lang forms
Hyperopia with Esotropia/ 3 year old female

- **Repeat Cover Test** (later in exam)
  - $\text{AE(T)}' \approx 20\Delta$

- Dry Retinoscopy = $+2.50$ D sphere OU  20/20 OD, OS
- Trial Frame = $+3.50$ D sphere OU  20/25 OD, OS

- **Repeat Cover Test with +3.50 OU**
  - Orthophoic

- **Cycloplegic Retinoscopy**
  - $+5.00$ D sphere OU
Hyperopia with Esotropia: 3 year old female

☐ **Assessment**
- Accommodative Esotropia

☐ **Plan**
- Rx given +4.00 OU
- RTC 1 month after Rx wear for re-evaluation
Hyperopia with Esotropia

- **Accommodative Esotropia**

  - **Clinical Characteristics**
    - Onset → 6 months – 7 years (mean = 2.5 years)
    - Gradual, intermittent
    - Magnitude of strabismus at near > distance
    - Amblyopia rare at onset

  - **Mechanisms**
    - Uncorrected hyperopia (+2.00 - +7.00)
    - High AC/A ratio (with low hyperopia)
    - Combination
Case Example

9 year old Caucasian male
Case History

- Red eye x 4 mo. OS, “bump” on LUL (has increased in size over time)

- (+) seasonal allergies, Rx given for Pataday, uses daily, NI

- Patient is miserable with red eye
  - (+) discharge, tearing, photophobia, itching, redness OS
  - Also note skin “bumps” on L side of mouth (PCP says they are related to chicken pox family)
  - Brother also had bumps on arms (have resolved) possibly molluscum???
Refractive Error History

- Last eye exam 8 months ago (do not have exam info)
- 1st Rx at 5 yo

Rx
- -3.00 -1.50 x 180 OD 20/20
- -3.75 -1.00 x 005 OS 20/60
Anterior Segment Evaluation

- OD - wnl
- OS
  - Vascularized lesion on LUL 2mm round
  - 3+papillae upper and lower palpebral conjunctiva
  - Upper and lower lid edema
  - 4+ injection upper bulbar conjunctiva
  - (+) conjunctival chemosis
Molluscum Dx

- Surgeon assessed that day
- Surgical Removal planned at weeks end
  - Once lesion removed all sx should resolve immediately

- Will re-appt patient Post-op to investigate decreased VA OS
Molluscum

- Molluscum contagiosum is caused by a virus that is a member of the poxvirus family.

- Common infection in children and occurs when a child comes into direct contact with a lesion. It is frequently seen on the face, neck, armpit, arms, and hands but may occur anywhere on the body except the palms and soles.

- The virus can spread through contact with contaminated objects, such as towels, clothing, or toys.

- In people with normal immune systems, the disorder usually goes away on its own over a period of months to years.

- Individual lesions may be removed surgically, by scraping, de-coring, freezing, or through needle electrosurgery. Surgical removal of individual lesions may result in scarring.
Molluscum

Treatment may be sought for the following reasons:

- Medical issues including:
  - Bleeding
  - Secondary infections
  - Itching and *discomfort*
  - Potential scarring
  - *Chronic keratoconjunctivitis*

- Social reasons
  - *Cosmetic*
  - Embarrassment
  - Fear of transmission to others
  - Social exclusion
Possible reasons for decreased VA OS

- Blur 2º to conjunctivitis (tearing and discharge)
- Incorrect refractive error correction
- Amblyopia
  - Due to......?
One month Follow up exam

- Patient happy, all sn/sx of conjunctivitis resolved
- Examination today to evaluate decreased VA OS

-3.00 -1.50 x 180 OD  20/20
-3.75 -1.00 x 005 OS  20/60  PH  20/40 -2

- Retinoscopy/Manifest

-3.25 -1.50 x 180 OD  20/20
-3.00 -1.75 x 180 OS  20/40
One month Follow up exam

- **Cover Test** (cc)
  - Distance and Near 8-10 Δ CLET

- **EOM** – FROM OD, OS

- **Bruckner**
  - LE whiter and brighter

- **Stereopsis**
  - (-) RDS, (+) Stereo Fly

- **Worth 4 Dot**
  - 4 dots Near
  - LE Suppression at Distance

- **Visuosity** –

- **DFE** - wnl
Microtropia

- **Common Clinical Characteristics**
  - Small Angle Strabismus (≤ 8-10 Δ)
  - Amblyopia
  - Defective stereoacuity
    - No random dot stereopsis
  - Good Peripheral Fusion
  - Central suppression scotoma
Microtropia Evaluation

Rule Out: Refractive Error / Ocular Pathology

- Stereopsis Testing - Random Dot Stereopsis
- Eye alignment evaluation
  - UCT
  - Bruckner
- Eccentric Fixation evaluation
  - Visuoscropy
- 2° (sensory) Fusion evaluation
  - Worth 4- Dot
Random Dot Stereopsis
Stereo Fly Testing
Worth 4-dot
Red Right Eye

Green Left Eye
Worth 4-dot
Fusion = 4 Dots
Right Eye Suppression
Case Example

**Strabismus**

*Pathologic vs non-pathologic*
15 year old AA Male

- ER patient
- Blurry vision OD, Left eye crossing in x 5 days
- (+) diplopia
  - Horizontal
  - Constant
  - All distances
- No hx of trauma
- No pain
15 year old AA Male ER visit

VA
- Distance = 20/50 OD, OS
- Near = 20/20 OD, OS

PERRLA (-) APD

SLE – wnl

CF = FTFC

EOM’s = -2 abduction deficit OD, OS

(−) palpation of orbital mass

IOP = OD 17, OS 15

CT
- Distance = 30Δ CLET
- Near = 25 Δ CLET

DFE – wnl OD < OS

Referral to peds/BV clinic
15 yo AA Male
Pediatric service evaluation

- **VA**
  - Distance = 20/50 OD, OS
  - Near = 20/20 OD, OS

- **EOMS** – (-)1 Abduction deficit OS

- Partially dilated (from cyclo x 2days??)

- **CT**
  - Distance = 35Δ CAET, 6Δ RHT
  - Near = 35 Δ CAET, 6Δ RHT

- **Retinoscopy**
  - -1.25 OU (20/20 VA)

- **Stereopsis**
  - (-) Fly
  - (-) appreciation with 35 Δ BO
15 yo AA Male

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Worth 4 dot

- Uncrossed Diplopia

- Fusion w/ 40Δ BO
Uncrossed Diplopia

Worth 4 Dot Testing
Fusion with 40 ∆ Base OUT
15 yo AA Male

- **Assessment**
  - Sudden Onset (Acquired), Large Angle Esotropia w/ diplopia

- **Plan**
  - MRI scheduled
Review of data

☐ VA
  ■ ↓ distance, adequate near = Myopia
  ■ (-) amblyopia = recent onset

☐ Large angle, constant, comitant deviation with diplopia
  ■ RECENT ONSET

☐ Fusion – unstable motor fusion
MRI Summary

- The L SOV is enlarged as is the L ICA
- dx is *carotid cavernous fistula*
- His is slightly proptotic on the left as well.
- Is the conjunctiva injected, and can you hear his pulse in the left globe?
Carotid Cavernous Fistula (CCF)

- results from an abnormal communication between the arterial and venous systems within the cavernous sinus in the skull. It is a type of arteriovenous fistula. As arterial blood under high pressure enters the cavernous sinus, the normal venous return to the cavernous sinus is impeded and this causes engorgement of the draining veins, manifesting most dramatically as a sudden engorgement and redness of the eye of the same side.

- Radiologic techniques are used in embolization of carotid-cavernous fistulas (CCFs). Angiography is invaluable for the guidance of catheter placement and delivery of the embolization materials. Angiography, computed tomography (CT) scanning, magnetic resonance imaging (MRI), and magnetic resonance angiography (MRA) are also useful in assessing the effectiveness of treatment.
Carotid Cavernous Fistula (CCF)

- Clinical Signs
  - marked congestion of the eyelids, conjunctiva and orbit
    - a red, congested eye that is often mistreated as an ocular infection or inflammation
  - proptosis (which is often pulsatile)
  - limitation of ocular movement
  - diplopia
  - ophthalmoplegia (often from CN VI palsy)
  - tinnitus or orbital bruit

- Interventional radiologist
Case Example

Strabismus

Pathologic vs non-pathologic
12 y.o. male

Background Info

- 1998 - 1st visit Primary Care Evaluation
  - No Rx
  - 20/20 VA OD, OS unaided
  - Cover Test
    - 10△ RE(T)
    - 15△ RE(T)'
  - Stereopsis: (+) Forms (sc)
12 y.o. male

Background Info

- **Dry Refraction**
  - +0.75 sph
  - +1.00 sph

- **Wet Retinoscopy** (Tropicamide only)
  - +2.00 sph
  - +3.00 sph

- **Rx given**
  - +1.50 sph  20/20
  - +2.00 sph  20/20
INDICATIONS OF A CYCLOPLEGIC EXAM

- **ESOTROPIA**
  - Moderate to high hyperopia
  - Suspected latent hyperopia
  - Suspected pseudomyopia
  - Uncooperative/non-communicative patients
  - Suspected malingering
  - Suspected hysterical amblyopia
  - Acuity not corrected to predicted level
  - Variable / inconsistent responses during manifest refraction
  - Symptoms seem unrelated to degree of RE
12 y.o. male / Case History

Return visit (one year later) c/o diplopia

- Intermittent diplopia at distance > near
  - Horizontal
  - Worse in PM / when tired
- Long standing Esotropia (per pt & case worker)
  - Unsure of age of onset
- Cosmesis has worsened in the past 6 months

- **Habitual Rx**
  - +1.50 sph
  - +2.00 sph
12 y.o. male

- **CT results (cc)**
  - 35 $\Delta$ AET
  - 35 $\Delta$ AET’
  - LE fixation preferred 85%
12 y.o. male

- Results with RE & LE Fixating identical

**ACT 9 DAF**

30-35 △BO

30-35 △BO

30-35 △BO

30-35 △BO

- **EOMs** = Overacting Inferior Oblique
  - OD  3+
  - OS  2+
12 y.o. male

- **Habitual Rx**
  - +1.50 sph
  - +2.00 sph

- **Cycloplegic Retinoscopy**
  - +3.50 D
  - +4.50 D

- **New Rx**
  - +3.00 20/20
  - +4.00 20/20

- **F/U CT results (cc)**
  - 35 Δ AET
  - 35 Δ AET′
12 year old male

- **Sensory Vergence Evaluation**
  - *Worth 4-Dot* (red Lens OD)
    - 5 dots, uncrossed diplopia, distance and near
    - neutralize with $35^\Delta$ BO $\rightarrow$ 4 dots

- **Stereopsis Evaluation**
  - *Randot Stereopsis Test*
    - (-) Random Dot Forms
    - neutralize with $35^\Delta$ BO $\rightarrow$ (+) Forms
Uncrossed Diplopia

Worth 4 Dot Testing
Fusion with 30 Δ Base OUT
12 year old male

Assessment ?

Plan??

Treatment Options???
12 year old male

Assessment:
- Hyperopia OU
- Acquired Esotropia (non-pathological)
  - no accommodative component
  - CAET, LE Fixation preference
  - Unstable sensory and motor fusion
  - (+) fusion capabilities

Treatment Options:
- Surgical correction
- Prismatic correction
- Orthoptic treatment
# Summary of Orthoptic Treatment

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<th><strong>Prism amount</strong></th>
<th><strong>Date Rxed</strong></th>
<th><strong>Weeks of tx</strong></th>
<th><strong>comments</strong></th>
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<td>January 20</td>
<td>9</td>
<td>No diplopia with prism rx</td>
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<td>25Δ</td>
<td>March 27</td>
<td>2</td>
<td>No headaches</td>
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<td>20Δ</td>
<td>April 17</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>15Δ</td>
<td>June 12</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>10Δ</td>
<td>June 26</td>
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Prism Rx given with weekly active orthoptic therapy

Orthoptic therapy increases divergence (BI) amplitudes

This allows a decrease in the amount of Fresnel prism in $5\Delta$ steps

A decreased magnitude of prism correction helps to increase fusional effort & slow vergence adaptation

Over a 6 month period the neutralizing prism was decreased from

$30\Delta$ base out Fresnel OS

$10\Delta$ base out ground into spectacles

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<tbody>
<tr>
<td>OD</td>
<td>+3.00 D</td>
<td>5$\Delta$ BO</td>
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<tr>
<td>OS</td>
<td>+4.00 D</td>
<td>5$\Delta$ BO</td>
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Diagnosis and Management of the Pediatric Patient

Pediatric Refractive Error
Amblyopia
Strabismus
Pathology
QUESTIONS?

Contact:

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