Amblyopia 101:
How to use Current Amblyopia Research in Clinical Practice

Valerie M. Kattouf O.D.
Chief, Pediatric/Binocular Vision Service
FAAO, FCOVD
Illinois College of Optometry
Associate Professor

Amblyopia is the condition in which the observer saw nothing and the patient very little.”
(Von Graefe 1888)

PREVALENCE OF AMBLYOPIA

- 2% of population
- Leading cause of monocular vision loss in the 20-70 age group
- Responsible for more vision loss than all ocular disease combined

Amblyopia Definition

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

Strabismic Amblyopia

CONSTANT / UNILATERAL Strabismus
Refractive Amblyopia

Strabismic and Refractive Causes of Amblyopia

Image Degradation Amblyopia

14 month old female

<table>
<thead>
<tr>
<th>Case findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>VA sc</td>
</tr>
<tr>
<td>Cover Test</td>
</tr>
<tr>
<td>Stereopsis</td>
</tr>
<tr>
<td>Retinoscopy</td>
</tr>
<tr>
<td>Anterior Segment Evaluation</td>
</tr>
<tr>
<td>Dilated exam</td>
</tr>
</tbody>
</table>

Review of types of amblyopia

- Anisometropic Amblyopia
- Strabismic Amblyopia
- Isometropic Amblyopia
- Image degradation Amblyopia

Potentially Amblyogenic Refractive Errors

<table>
<thead>
<tr>
<th>Isometric Amblyopia</th>
<th>Dipters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astigmatism</td>
<td>&gt; 2.50</td>
</tr>
<tr>
<td>Hyperopia</td>
<td>&gt; +5.00</td>
</tr>
<tr>
<td>Myopia</td>
<td>&gt; -8.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anisometric Amblyopia</th>
<th>Dipters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astigmatism</td>
<td>&gt; 1.50</td>
</tr>
<tr>
<td>Hyperopia</td>
<td>&gt; +1.50</td>
</tr>
<tr>
<td>Myopia</td>
<td>&gt; -3.00</td>
</tr>
</tbody>
</table>
Determining the Best Treatment Options

Traditional Amblyopia Treatment

- Refractive Error Correction
  - Occlusion
  - Atropine

Amblyopia Severity

- Severe - worse than 20/100
- Moderate - better 20/80

PEDIG Studies

- PEDIG
  - Pediatric Eye Disease Investigator Group (PEDIG) is a collaborative network dedicated to facilitating multicenter clinical research in strabismus, amblyopia and other eye disorders that affect children.
  - The network, which was formed in 1997, is funded by the National Eye Institute (NEI)
  - http://pedig.jaeb.org/Publications.aspx

Amblyopia Treatment

PEDIG studies simplified

Questions addressed by PEDIG Studies

- How well do glasses alone treat amblyopia?
- Do we really know that occlusion works?
- How many daily hours of prescribed occlusion are necessary?
- What happens when occlusion is stopped?
- Does occlusion work in older children?
- Does atropine work as well as occlusion?
- How often does Atropine need to be used?

And so on....
Table 4.1: Randomized controlled trials of intravitreal bevacizumab for neovascular age-related macular degeneration (NVAMD) studies using RTV with bevacizumab

<table>
<thead>
<tr>
<th>Study</th>
<th>No. of Patients (age at enrollment)</th>
<th>Follow-up Period</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomized control trial comparing intravitreal bevacizumab vs. placebo after 6 months (ATS 1)</td>
<td>601 (60-79 years)</td>
<td>6 months</td>
<td>100% improvement in BCVA in bevacizumab group vs. 80% in placebo group.</td>
</tr>
<tr>
<td>Randomized control trial comparing intravitreal bevacizumab vs. placebo after 1 year (ATS 2)</td>
<td>500 (60-79 years)</td>
<td>1 year</td>
<td>80% improvement in BCVA in bevacizumab group vs. 60% in placebo group.</td>
</tr>
</tbody>
</table>

Case Example

7 year old male

Case findings

<table>
<thead>
<tr>
<th>Snellen VA</th>
<th>Distance</th>
<th>Near</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>OS</td>
<td>OD</td>
</tr>
<tr>
<td>20/60</td>
<td></td>
<td>20/20</td>
</tr>
<tr>
<td>20/50</td>
<td></td>
<td>20/20</td>
</tr>
</tbody>
</table>

Distance/Near Cover Test: ortho
Cycloplegic retinoscopy: +2.50 -3.50 x 180 OD
Cycloplegic retinoscopy: +2.00 -1.50 x 180 OS
Stereopsis cc: (+) Forms, (+) Fly
Trial Frame Rx: +1.00 - 3.00 x 180 20/40
+0.50 - 1.00 x 180 20/20
Potentially Amblyogenic Refractive Errors

<table>
<thead>
<tr>
<th>Anisometropic Amblyopia</th>
<th>Dipters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astigmatism</td>
<td>&gt; 1.50</td>
</tr>
<tr>
<td>Hyperopia</td>
<td>&gt; +1.50</td>
</tr>
<tr>
<td>Myopia</td>
<td>&gt; -3.00</td>
</tr>
</tbody>
</table>

Dx: Anisometropia Amblyopia

High refractive error OD vs. OS
UNILATERAL decrease in VA

Assessment / Plan

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

- **Plan**
  - Rx given
    - +1.00 -3.50 x 180 OD
    - +0.50 -1.50 x 180 OS
    - RTC 1 month after Rx dispense

PEDIG Studies

**Spectacle Correction**

PEDIG Studies

Rx correction only

- **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

Case Example

7 year old male
2 months after wearing Rx

Case findings

<table>
<thead>
<tr>
<th>Refractive Correction</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+1.00 -3.50 x 180</td>
<td>+0.50 -1.50 x 180</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Snellen VA</th>
<th>Distance</th>
<th>Near</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>20/20</td>
<td>20/20</td>
</tr>
<tr>
<td>OS</td>
<td>20/20</td>
<td>20/20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distance/Near Cover Test</th>
<th>ortho</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereopsis cc</th>
<th>(+) Forms, (+) Fly</th>
</tr>
</thead>
</table>

- **PEDIG Studies**

  - **Spectacle Correction**
    - 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
PEDIG Studies

Rx correction only

- 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 year old male, 2nd grade
2nd opinion on spectacle Rx, 1st Rx given x 3 days prior
Initial symptoms: c/o distance blur, close working distance, excessive blinking and eye rubbing, poor reading skills

Case findings

<table>
<thead>
<tr>
<th>Current RX</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+3.00</td>
<td>+3.00</td>
</tr>
<tr>
<td></td>
<td>-6.00</td>
<td>-6.00</td>
</tr>
<tr>
<td></td>
<td>x 180</td>
<td>x 180</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Snellen VA cc</th>
<th>Distance OD</th>
<th>Distance OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD</td>
<td>20/100</td>
<td>20/100</td>
</tr>
<tr>
<td>OD</td>
<td>20/80</td>
<td>20/80</td>
</tr>
</tbody>
</table>

Distance/Near Cover Test: ortha

<table>
<thead>
<tr>
<th>Stereoopsis</th>
<th>(-) Forens, (-) Fly</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>K readings</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-40.00 / -40.60 (9.30 D)</td>
<td>-40.58 / -40.85 (9.73 D)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Retinoscopy</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+3.50</td>
<td>+3.00</td>
</tr>
<tr>
<td></td>
<td>-6.00</td>
<td>-6.00</td>
</tr>
<tr>
<td></td>
<td>x 180</td>
<td>x 180</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cycloplegic retinoscopy</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+4.50</td>
<td>+3.50</td>
</tr>
<tr>
<td></td>
<td>-5.50</td>
<td>-4.50</td>
</tr>
<tr>
<td></td>
<td>x 180</td>
<td>x 180</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case findings</th>
<th>Dilated exam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unremarkable</td>
</tr>
</tbody>
</table>

Dx: Isometropic Amblyopia

High refractive error OU
BILATERAL decrease in VA

Potentially Amblyogenic Refractive Errors

<table>
<thead>
<tr>
<th>Isometropic Amblyopia</th>
<th>Diopters</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.50</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Astigmatism</th>
<th>Hyperopia</th>
<th>Myopia</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 2.50</td>
<td>&gt; 5.00</td>
<td>&gt; 8.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RTC with new RX</th>
<th>Perform corneal topography</th>
<th>Discussed options of CL fit</th>
</tr>
</thead>
</table>
7 year old male, 2nd grade
3 week follow up

<table>
<thead>
<tr>
<th>Case findings</th>
<th>OB</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Updated RX</td>
<td>+2.00</td>
<td>+2.50</td>
</tr>
<tr>
<td>Snellen VA cc</td>
<td>-5.50 x 180</td>
<td>-4.50 x 180</td>
</tr>
<tr>
<td>Distance/Near Cover Test</td>
<td>20/50</td>
<td>20/50</td>
</tr>
<tr>
<td>Stereopsis</td>
<td>ortho</td>
<td></td>
</tr>
</tbody>
</table>

Where do we go from here?

PEDIG Studies
Treatment of bilateral refractive amblyopia in children three to less than 10 years of age.

- Purpose: To determine the amount and time course of binocular visual acuity improvement during treatment of bilateral refractive amblyopia
- Criteria: Previously untreated, 20/40-20/400
- Results at 1 year:
  - 20/40 - 20/80 → 3.4 lines of improvement
  - 20/100 - 20/320 → 6.3 lines of improvement
  - 20/25 or better...
    - 21% at 5 weeks
    - 46% at 13 weeks
    - 59% at 26 weeks
    - 74% at 52 weeks

PEDIG Studies
Treatment of bilateral refractive amblyopia in children three to less than 10 years of age.

- Purpose: To determine the amount and time course of binocular visual acuity improvement during treatment of bilateral refractive amblyopia
- Conclusion: Treatment of bilateral refractive amblyopia with spectacle correction improved binocular visual acuity in children three to less than 10 years of age, with most improving to 20/25 or better within one year.
Case Example

5 year old male
State required exam for Kindergarten entrance

Case findings

<table>
<thead>
<tr>
<th>Snellen VA sc</th>
<th>Distance</th>
<th>Near</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OD</td>
<td>OS</td>
</tr>
<tr>
<td></td>
<td>20/125</td>
<td>20/20</td>
</tr>
<tr>
<td>Distance/Near Cover Test</td>
<td>ortho</td>
<td>Stereopsis</td>
</tr>
<tr>
<td>Retinoscopy</td>
<td>+5.50 sph</td>
<td>+2.50 sph</td>
</tr>
<tr>
<td>Cycloplegic retinoscopy</td>
<td>+6.50 sph</td>
<td>+3.50 sph</td>
</tr>
<tr>
<td>Dilated exam</td>
<td>unremarkable</td>
<td></td>
</tr>
</tbody>
</table>

Distance

OD        OS
20/125    20/20
20/200    20/20

5 year old male
State required exam for Kindergarten entrance

Progress

October
2 month follow up
Continue FTW of Rx

Snellen VA sc
Distance
OD   OS
20/125 20/20
20/200 20/20

Retinoscopy
+5.50 sph
+2.50 sph

Cycloplegic retinoscopy
+6.50 sph
+3.50 sph

Rx given
+4.50 sph
+1.50 sph

Dx: Anisometropia Amblyopia

High refractive error OD vs. OS
UNILATERAL decrease in VA

Potentially Amblyogenic Refractive Errors

Anisometropic Amblyopia

Axial ametropia

Hyperopia

Astigmatism

Myopia

Dx: Anisometropia Amblyopia

High refractive error OD vs. OS

UNILATERAL decrease in VA

Potential increases in refractive errors

Anisometropic Amblyopia

Axial ametropia

Hyperopia

Astigmatism

Myopia

Rx: +4.50 sph +1.50 sph

Full time wear of Rx
RTC 2 months

Dx: Anisometropia Amblyopia

High refractive error OD vs. OS
UNILATERAL decrease in VA

Potential increases in refractive errors

Anisometropic Amblyopia

Axial ametropia

Hyperopia

Astigmatism

Myopia

Rx: +4.50 sph +1.50 sph

Full time wear of Rx
RTC 2 months

Dx: Anisometropia Amblyopia

High refractive error OD vs. OS
UNILATERAL decrease in VA

Potential increases in refractive errors

Anisometropic Amblyopia

Axial ametropia

Hyperopia

Astigmatism

Myopia

Rx: +4.50 sph +1.50 sph

Full time wear of Rx
RTC 2 months
5 year old male
State required exam for Kindergarten entrance

<table>
<thead>
<tr>
<th>Case findings</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Rx</td>
<td>-4.50 sph +1.50 sph</td>
<td>20/100</td>
</tr>
<tr>
<td>Cycloplegic retinoscopy</td>
<td>7.00 -3.00 x 180</td>
<td>+3.00 sph</td>
</tr>
<tr>
<td>New Rx</td>
<td>-6.00 -1.50 x 180</td>
<td>20/80</td>
</tr>
</tbody>
</table>

**20/30***

7 month follow up
May
9 month follow up
August
12 month follow up

---

**PEDIG Studies**

**Occlusion**

Prior to PEDIG 6 hours daily = norm

---

**PEDIG Studies**

**Atropine**

Functions by its inhibition of accommodation, preventing the better seeing eye from being used at near fixation distances

---

**PEDIG Studies**

**Atropine vs. Occlusion (3-7 y.o.) (ATS 1)**

- Same results
- Treatment 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

---

**PEDIG Studies**

**Occlusion Dosage results**

- 2 hours vs. 6 hours = No difference (ATS 2B)
- 6 hours vs. Full time = No difference (ATS 2A)
- Severe amblyopes
- 2-6 hours occlusion vs. daily Atropine (ATS 1)
  - Similar results
  - 2-3 lines of VA improvement

---

**PEDIG Studies**

**Atropine**

Functions by its inhibition of accommodation, preventing the better seeing eye from being used at near fixation distances

---

**PEDIG Studies**

**Atropine vs. Occlusion (3-7 y.o.) (ATS 1)**

- Same results
- Treatment 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

---
PEDIG Studies
Atropine and...

- Atropine vs. Occlusion Cost effectiveness
  - Patching
    - Adhesive patches 35 cents/per x 6 months - $100
  - Atropine
    - One 15 mL bottle lasts 6 months - $15

PEDIG Studies
Atropine and Occlusion Psychosocial Effect

- Amblyopia Treatment Index
  - 20 question test assesses the psychosocial impact on the child and the family in regard to amblyopia treatment
  - Evaluated after 5 weeks of treatment
  - Atropine treatment better tolerated in regard to:
    - Adverse effects
    - Difficulty with compliance
    - Social stigma

PEDIG Studies
Near activities while patching..ATS06

- To determine whether "near" activities enhance the effect of patching on visual acuity improvement in strabismic and anisometropic amblyopia when compared with "distance" activities in the treatment of moderate amblyopia and severe amblyopia in children 3 to <7 years old.

  - Results:
    - At 8 weeks, improvement in amblyopic eye visual acuity averaged 2.6 lines in the distance activities group and 2.5 lines in the near activities group
    - At the 17-week examination, children with severe amblyopia improved a mean of 3.6 lines with 2 hours of daily patching

  - Conclusions:
    - Performing common near activities does not improve visual acuity outcome when treating anisometropic, strabismic, or combined amblyopia with 2 hours of daily patching.
    - Children with severe amblyopia may respond to 2 hours of daily patching.

PEDIG Studies
ATS02C: An Observational Study on Recurrence of Amblyopia After Discontinuation of Treatment

- Recurrence occurred in 35 (24%) of 145 cases and was similar in patients who stopped patching (25%) and in patients who stopped atropine (21%).

  - Conclusions:
    - Approximately one fourth of successfully-treated amblyopic children experience a recurrence within the first year off treatment. For patients treated with 6 or more hours of daily patching, our data suggest that the risk of recurrence is greater when patching is stopped abruptly rather than when it is reduced to 2 hours per day prior to cessation. A randomized clinical trial of no weaning versus weaning in successfully-treated amblyopia is warranted to confirm these observational findings.

PEDIG Studies
To determine whether age at initiation of treatment for amblyopia influences the response among children 3 to less than 13 years of age with unilateral amblyopia who have 20/40 to 20/400 amblyopic eye visual acuity.

- Amblyopia is more responsive to treatment among children younger than 7 years of age. Although the average treatment response is smaller in children 7 to less than 13 years of age, some children show a marked response to treatment.
**Case Example**

4 year old female

**c/o eye turn noted in infancy, increasing frequency, LE only**

**Case findings**

<table>
<thead>
<tr>
<th>Snellen VA</th>
<th>Distance</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20/20</td>
<td>20/200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distance/Near Cover Test</th>
<th>30Δ CLET</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Stereopsis cc</th>
<th>(-) Faves, (-) Fly</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Refractive Correction</th>
<th>OS: +1.00 -1.00 x 180</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OS: +1.00 -1.00 x 180</td>
</tr>
</tbody>
</table>

**Dx: Strabismic Amblyopia**

No significant refractive error OD vs. OS

UNILATERAL decrease in VA

---

**Case Example**

4 year old female

**c/o eye turn noted in infancy, increasing frequency, LE only**

**Case findings**

<table>
<thead>
<tr>
<th>Snellen VA</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OD</td>
</tr>
<tr>
<td></td>
<td>20/20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distance/Near Cover Test</th>
<th>30Δ CLET</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Stereopsis cc</th>
<th>(-) Faves, (-) Fly</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Refractive Correction</th>
<th>OS: +1.00 -1.00 x 180</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OS: +1.00 -1.00 x 180</td>
</tr>
</tbody>
</table>

No Rx given

Began 2 hours daily occlusion OD

Poor / intermittent compliance with occlusion tx

One year results

Snellen VA: VA improved from 20/200 to 20/80

Distance/Near Cover Test: 30Δ CLET

Stereopsis cc: (-) Faves, (-) Fly

---

**Case Example**

5 yo male

- 1st exam April, outside Vision Center
- Referral for vision therapy

**Diagnosis:**

- Bilateral Isometric/Refractive Amblyopia
  - BVA (Distance) 20/200 OD, OS, OU; NVA 20/80 OD
  - (-) strabismus
  - Trial frame caused diplopia
    - Trial framed full Rx
    - No Rx given secondary to pending consultation
### Case

5 yo male

- IEI Peds Service Exam one month later
- Cc: holds things close to read, no developmental delays noted
- DVA: 20/125 OD, OS, OU
- NVA: 20/200 OD, OS, OU
- CT: ortho

### Retinoscopy / Refraction

#### Dry Ret
- +9.50 -2.00 x 180 OD: 20/80
- +9.50 -2.00 x 180 OS: 20/80
- 20/80 OU

#### Trial Frame to determine plus acceptance:
- +7.50 -2.00 x 180 OU: B:20/80 N:20/60
- +5.50 -2.00 x 180 OU: B:20/50 N:20/80

#### Cycloplegic Ret
- +9.50 -2.00 x 180 OU

### Assessment / Plan

#### Assessment
- Isometropic Amblyopia
- High Hyperopia / Astigmatism OU (no previous Rx hx)

#### Plan
- Rx given
- +5.50 -2.00 x 180 OD
- +5.50 -2.00 x 180 OS
- Add +2.00 D

### Dx: Isometropia Amblyopia

High refractive error OU
BILATERAL decrease in VA

### 5 year old male

**ONE month follow up / all testing with Rx wearing Rx FT with comfort**

<table>
<thead>
<tr>
<th>Snellen VA cc</th>
<th>Distance OD</th>
<th>Distance OS</th>
<th>Near OD</th>
<th>Near OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>20/50</td>
<td>20/50</td>
<td>20/40</td>
<td>20/40</td>
</tr>
<tr>
<td>OS</td>
<td>20/50</td>
<td>20/50</td>
<td>20/40</td>
<td>20/40</td>
</tr>
</tbody>
</table>

**Rx**
- OD: +5.50 -2.00 x 180
- OS: +5.50 -2.00 x 180
- Add +2.00 D

**Distance/Near Cover Test**
- ortho

**Stereopsis**
- ( ) Formes, ( ) Fly

**Ret over Rx**
- +4 D

**VA with additional +2D**
- NI

### 5 year old male

**TWO month follow up / all testing with Rx wearing Rx FT with comfort**

<table>
<thead>
<tr>
<th>Snellen VA</th>
<th>Distance OD</th>
<th>Distance OS</th>
<th>Near OD</th>
<th>Near OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>20/50</td>
<td>20/40</td>
<td>20/40</td>
<td>20/40</td>
</tr>
<tr>
<td>OS</td>
<td>20/50</td>
<td>20/40</td>
<td>20/40</td>
<td>20/40</td>
</tr>
</tbody>
</table>

**Rx**
- OD: +5.50 -2.00 x 180
- OS: +5.50 -2.00 x 180
- Add +2.00 D

**Distance/Near Cover Test**
- ortho

**Stereopsis**
- ( ) Formes, ( ) Fly

**Ret over Rx**
- +4 D

**VA with additional +2D**
- DVA 20/25 OU, NVA 20/30 OU
NEW RX

- Increase plus in Rx
- Eliminate Bifocal

- +8.00 -2.00 x 180 OD
- +8.00 -2.00 x 180 OS

- RTC 3 months

5 year old male
FIVE month follow up / all testing with Rx wearing Rx FT with comfort

<table>
<thead>
<tr>
<th>Case Findings</th>
<th>Distance</th>
<th>Near</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OD</td>
<td>OS</td>
</tr>
<tr>
<td></td>
<td>OD</td>
<td>OS</td>
</tr>
<tr>
<td>Snellen VA</td>
<td>OD</td>
<td>OS</td>
</tr>
<tr>
<td>OD 20/30 OS 20/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD 20/30 OS 20/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance/Near Cover Test</td>
<td>6△ CRET</td>
<td></td>
</tr>
<tr>
<td>Stereopsis</td>
<td>( ) forms ( ) fly</td>
<td></td>
</tr>
<tr>
<td>W 4 Dot</td>
<td>4 dots near, suppression distance</td>
<td></td>
</tr>
<tr>
<td>Bruckner</td>
<td>Whiter, brighter OD</td>
<td></td>
</tr>
<tr>
<td>Visuoscopy</td>
<td>2△ nasal EF</td>
<td></td>
</tr>
</tbody>
</table>

Bruckner Test

Microtropia / Small Angle Esotropia

<table>
<thead>
<tr>
<th>Common Clinical Characteristics</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Angle Strabismus (≤ 8-10 Δ)</td>
<td>YES</td>
</tr>
<tr>
<td>Amblyopia</td>
<td>YES</td>
</tr>
<tr>
<td>Defective stereoaucity</td>
<td>YES</td>
</tr>
<tr>
<td>Good Peripheral Fusion</td>
<td>YES</td>
</tr>
<tr>
<td>Central suppression scotoma</td>
<td>YES</td>
</tr>
</tbody>
</table>

Microtropia

<table>
<thead>
<tr>
<th>Variable Clinical Characteristics</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement on UCT</td>
<td>YES</td>
</tr>
<tr>
<td>Size of deviation (2-10 Δ)</td>
<td>6△</td>
</tr>
<tr>
<td>Presence of Eccentric Fixation</td>
<td>YES</td>
</tr>
<tr>
<td>Presence of Anisometropia</td>
<td>NO</td>
</tr>
</tbody>
</table>
Microtropia

**Test Sequence**
- Visual Acuity
- Cover test: movement or no movement
- Random Dot Stereopsis
- Stereo Fly
- Bruckner Test
- Worth 4 dot - fusion at near (peripheral) / suppression at distance (central)
- Visuscopy

**Assessment / Plan**

- **Assessment**
  - Strabismic Amblyopia OD
  - High Hyperopia / Astigmatism OU

- **Plan**
  - Rx given
  - +8.00 - 2.00 x 180 OD
  - +8.00 - 2.00 x 180 OS

**Amblyopia Definition**

**DEFINITION OF FUNCTIONAL AMBLYOPIA**

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

**Review of types of amblyopia**

- Anisometropic Amblyopia
- Strabismic Amblyopia
- Isometropic Amblyopia
- Image degradation Amblyopia

**Potentially Amblyogenic Refractive Errors**

<table>
<thead>
<tr>
<th>Isometric Amblyopia</th>
<th>Dipters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astigmatism</td>
<td>&gt; 2.50</td>
</tr>
<tr>
<td>Hyperopia</td>
<td>&gt; +5.00</td>
</tr>
<tr>
<td>Myopia</td>
<td>&gt; -8.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anisometric Amblyopia</th>
<th>Dipters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astigmatism</td>
<td>&gt; 1.50</td>
</tr>
<tr>
<td>Hyperopia</td>
<td>&gt; +1.50</td>
</tr>
<tr>
<td>Myopia</td>
<td>&gt; -3.00</td>
</tr>
</tbody>
</table>
Questions addressed by PEDIG Studies

- How well do glasses alone treat amblyopia?
- Do we really know that occlusion works?
- How many daily hours of prescribed occlusion are necessary?
- What happens when occlusion is stopped?
- Does occlusion work in older children?
- Does atropine work as well as occlusion?
- How often does Atropine need to be used?

And so on....

QUESTIONS?

Contact:

Valerie M. Kattouf O.D.
Illinois College of Optometry

vkattouf@ico.edu
(312) 949-7279