

## Beyond Patching: Current treatment of Amblyopia

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### Definition of Amblyopia

Condition in which best corrected visual acuity is **less than 20/20** in the absence of obvious structural or pathologic abnormalities, but with one or more **amblyogenic conditions** occurring **before age 6**:  
anisometropia, constant strabismus, bilateral isometropia, unilateral or bilateral astigmatism or image degradation.

### Types of Amblyopia

1. **Strabismic Amblyopia**: To avoid seeing double, brain ignores (suppresses) one eye  
*\*CONSTANT, UNILATERAL STRABISMUS*  
Rule out Microtropia (turn <5 Pd) with Cover Test (unilateral), Visuoscopy, and Global (Random Dot) Stereopsis
2. **Deprivation** - RARE!: Cataract at young age, Ptosis, Residual tissue in the vitreous
3. **Refractive Amblyopia**
  - 3a. **Bilateral ametropia**: Prescription is very strong in both eyes. Both eyes see distorted or blurred images, so the brain never learns how to interpret clear images  
*Isometric = Equal high refractive error*
    - +5.00 OU
    - -8.00 OU
    - -2.50 Astigmatism:
      - “Meridional” Amblyopia: Poorer acuity of axis 45/135 than at axis 180. Acuity typically about 20/50 – 20/70
  - 3b. **Anisometropia**: Unequal prescriptions between the two eyes.
    - Hyperopia: >+1.00 difference
    - Myopia: > -3.00 difference
    - Astigmatism: >-1.50 difference

### Development of Amblyopia

- Develops only during the first 6-8 years of life. \*This is a common malpractice concern – do not diagnose “Amblyopia” if vision REDUCTION occurs after age 8.  
-- Usually only affects ONE eye, but in some cases can affect BOTH eyes
  - Constant unilateral strabismus
  - Amblyogenic bilateral isometropia
  - Amblyogenic unilateral or bilateral astigmatism
  - Image degradation



## Amblyopia is the MOST COMMON reason for vision loss in children and young adults.

- Leading cause of monocular vision loss in the 20-70 age group
  - Prevalence of Amblyopia: 2-4%

### *Risk Factors:*

1. Low birth weight
2. Prematurity
3. Cerebral Palsy
4. Mental retardation
5. Exposure to smoking, drinking or drugs in utero
6. Family history of lazy eye, turned eye, or strong glasses prescription

### Signs of Amblyopia

1. Favoring one eye
2. Tilting or turning head
3. Eye that drifts or wanders in or out
4. Tendency to close or cover an eye
5. Rubbing eyes or excessive blinking

### Risks for Patients with Amblyopia

1. Damage to the 'good eye' could leave child visually impaired
2. Risk for patient sustaining blinding trauma to 'good eye' is 3X greater among adults and 17X greater among children

### Impact of Amblyopia

1. Risk for poor performance with near work
2. Affects self image and self confidence (eye turn)
3. Learning problems
4. Decreased sports performance due to lack of depth perception

### *What does the Visual Acuity Tell You?*

- Mild/Shallow 20/25 to 20/60
  - Onset at end of critical period
  - May have undergone previous treatment
- Moderate 20/70 to 20/100
- Deep 20/200 or worse

*Remember that Snellen does not have many letters at these critical sizes, has no contour control, no crowding control and unequal letters per line.*

### *Tests for Eccentric Fixation*

1. Visuoscopy
2. Angle Kappa, comparison of objective and subjective angles of turn
3. Haidinger's Brushes
4. After-Image transfer test

- This is the point on the retina that the patient associates with straight ahead.
- Check if a steady point, or scattered range. Usually is in the same direction as the eye turn (esotropes have nasal eccentric fixation)

1 degree = 2 line reduction (20/30)      2 degrees = 20/50      3 degrees = 20/70

Over 3 degrees is very rare.      IF WORSE THAN 20/70 – THEY ALSO HAVE AMBLYOPIA.

**Masquerading Syndromes:** Remember that Pathology CAN OCCUR in an Amblyopic eye: Additional testing must be considered to rule out an organic cause.

1. If the vision worsens
  2. If the patient reports other symptoms
  3. If there is a family history of poor vision related to eye disease
- Remember that Amblyopia must occur during the critical period of visual development
- Be extremely wary of complaints of blurred vision in an adult with no previous symptoms.
  - Be wary if the prescription doesn't match the severity of the reduced acuity

Rule out the presence of macular, retinal disease, optic nerve and visual pathway dysfunction:

1. Dilated fundus examination
  2. Visual field testing
  3. Contrast Sensitivity
  4. Color vision
  5. Electrodiagnostic testing
  6. Fluorescein angiography
  7. Electroretinography
1. Brain tumor affecting the visual pathway:
    - Symptoms include: Headache, Vomiting, Growth defects, Double vision, Visual Field Defects
    - Signs include: Reduced VA, Reduced Color Vision, Optic nerve pallor, Elevated optic nerves, Blurred disc margins
  2. Retinal Disease
    - Coat's Disease
    - Presumed Ocular Histoplasmosis
    - Retinoschisis

Signs include: Worse than 20/400 acuity, No acuity improvement when letters are isolated.
  3. Optic Nerve Diseases
    - Pediatric Glaucoma
    - Optic nerve dysplasia
    - Glaucoma

**Amblyopia Treatment Goal: strengthen the weaker eye's vision**

TREATMENT OPTIONS: Without treatment, amblyopia **will not** resolve.

- No treatment
- Passive Treatment
  - Lenses (Contacts, Glasses)
  - Prisms

- Active Treatment
  - Vision Therapy
  - Medication (Botox for strabismus, atropine etc.)
  - Surgery for eye turn, cataract, ptosis etc.
  - Patching with Occlusion
  - Patching with Filters

### *Prescribing for Amblyopia:*

1. Consider contact lenses for anisometropia  $>3.00$
2. Recommend Polycarbonate or Trivex materials \*Duty to warn, sports protection
3. Keep on axis – this is very difficult behind the phoropter. I recommend retinoscopy rack or trial lenses. You can also use prism over the fixating eye to cause a version movement so that the strabismic eye is straight.  
EX: Base-out over the fixating eye moves the esotropic eye outwards.
4. Utilize Keratometry or Topography to confirm astigmatism
5. Maximize plus to an esotrope
6. Minimize plus to an exotrope

### *Patching*

#### How Long to Patch?

- All waking hours = full-time occlusion
  - Rule of thumb: age = number of days patched
    - Example: Age 3 = patch 3 days/1 day off or reverse patching
    - Why reverse patch??
      1. To prevent embedding anomalous correspondence.
      2. To prevent deprivation Amblyopia in the better seeing eye.
  - High risk of Reverse Amblyopia if patient is less than 3 years old.
- Part-time
  - Recommended if patient is school-aged.
    1. Mild Amblyopia: 2 hours
    2. Moderate to Severe: 6 hours

#### Patching options:

- Monocular patching
- Binasal Occlusion
- Bitemporal Occlusion
- Occluding the non-amblyopic eye

#### Types of Patches:

1. Total occlusion
2. Adhesive bandage (Opticlude, Coverlet)
3. Blur foil (Bangerter), clear contact paper or transparent “magic” tape
4. Patch (Pirate-style or patchworks)
5. Spectacle clip
6. Frosted lens
7. Opaque contact lens
8. Over-plussed optical lens (spectacle or contact lens) \*typical is +8.00 D
9. Atropine penalization



- Education for the parents and patients is critical – Give a handout regarding dilated pupil (blur, light-sensitivity)
- Best for moderate-high hyperopia with shallow-moderate amblyopia
- Requires hyperopia left uncorrected in the non-amblyopic eye
- Patient must also be doing NEAR ACTIVITIES!

## Factors to Consider

1. Cosmetic Appearance
2. Compliance
3. Age
4. Visual acuity and performance needs
5. Binocularity issues

## Vision Therapy for Amblyopia

### “Active” Patching

- Rationale
  1. Increase efficacy of occlusion therapy
  2. reduce treatment time
  3. Improve visual deficits
  4. Better results with older amblyopes

## How Does The ‘Lazy Eye’ See Differently?

- Blurry vision (20/25 to 20/400)
- Reduced *contrast sensitivity*
- Difficulty with *eye tracking*
- Poor *eye focusing system*
- Affected eye has poor *spatial judgment*
- Poor form discrimination
- Deficient Accommodative skills (amplitude, accuracy & facility)
- Deficient eye movement skills
- Central suppression
- Deficient vergence skills

### Monocular Therapy Activities

1. Eye-hand coordination (throwing, hitting, tracing, drawing)
2. Resolution activities (hidden pictures, letter searches, card games)
3. Accommodative amplitude and facility (near-far focus, lenses)
4. Oculomotor skills (saccadic and pursuit training)
5. Pleoptic methods (after-image flash)

### Monocular in Binocular Field activities

1. Anaglyphic or Polarized TV Trainer and Bar Reader
2. Anaglyphic tracing books, playing cards, workbooks
3. Cheirosopic tracings (single oblique mirror stereoscope)

### Binocular Therapy

1. Accommodative amplitude and facility
2. Vergence amplitude and facility (SILO)



## Computerized Vision Therapy for Amblyopia

- Amblyopia Treatment Program (ATP) – <http://www.bernell.com/product/1186/137>
- RevitalVision

## When to Co-Manage with a Vision Therapy Office:

- Crowding affect
- Poor accommodative response
- Poor ocular motility
- Poor eye-hand coordination
- Suppression
- Poor localization in space
- Poor contrast sensitivity
- Poor fixational stability

## When to Co-management with Ophthalmology:

- Pathology
- Strabismus

When to consider surgery

Esotropia >20 pd

Exotropia >30 pd

Vertical >10 pd

## COMPLIANCE ISSUES

- Education of parents, patient, teacher, etc.
- Parents need to champion this cause
- Decorate patches & Eye Patch Club ([www.preventblindness.org/children/EyePatchClub.html](http://www.preventblindness.org/children/EyePatchClub.html))
- Home activity kits with instructions
- Track and demonstrate improvements in-office

## *Amblyopia Treatment Studies*      *ATS Studies: <http://public.pedig.jaeb.org/>*

### **ATS1:**

- Adhesive patch vs. atropine penalization with moderate amblyopia (20/40-20/100)
- Results: Similar magnitude of improvement in VA for children <7 yrs.

### **ATS2 Part A:**

- 6 hours/day vs. full time occlusion with severe amblyopia (20/100-20/400)
- Results: Similar magnitude of improvement in VA for children 3-7 yrs.

### **ATS2 Part B:**

- 2 hours/day vs. 6 hours/day occlusion with moderate amblyopia (20/40-20/80)
- \*Both groups had 1 hour/day of prescribed near activities during occlusion
- Results: Similar magnitude of improvement in VA for children 3-7 yrs.
- \*No time difference in VA results (both had similar rates of improvement)

### **ATS2 Part C:**

- Treated amblyopes under 8 (strab/aniso) w/initial VA<20/40 w/>3 lines improvement
- Compared stopping patching vs. stopping atropine.
- Similar recurrence rates; suggests weaning off of occlusion is beneficial

### **ATS3: Effectiveness of amblyopia treatment in 10 to 17-year-olds**

- \*Part-Time patching (>2 hours/day) with min. 1 hour/day of near visual activities
- Age does not prevent success of treatment (Wick et al. Optom Vis Sci 1992; 69:866-78)

### **It is never too late to treat amblyopia!**

Numerous studies show that vision loss in the non-amblyopic eye results in improved acuity in the amblyopic eye – even in adults.

Amblyopia can be treated after age 6! (Fastest and most complete remediation if treated by age 4)

### **ATS4:**

- Compared daily vs. weekend (2 days) atropine for moderate amblyopia (20/40-20/80)
- Results: Similar magnitude of improvement in VA for children 3-7 yrs.



Children with amblyopia may read only three to four hours of patching therapy a day, a recent study says.

### What is New?

1. PEDIG is currently enrolling study participants to compare the **efficacy and safety of oral levodopa** and patching versus oral placebo and patching at 18 weeks, after 16 weeks of treatment for amblyopia in children 7 to <13 years old followed by a two-week taper of oral medication.
2. **Acupuncture Plus Glasses May Help Improve Children's Amblyopia.** Reuters (4/29, Boerner) reported that in addition to wearing glasses, acupuncture may help children with amblyopia to improve their vision scores, according to a study in the journal *Ophthalmology*. The researchers gave half of a group of age 3- to 7-years old with amblyopia corrective glasses, who alternated between wearing glasses and receiving acupuncture treatments five times per week at 15-week intervals and compared the results to children who only wore glasses. All children had about 20/63 vision initially. However, at the end of the study the acupuncture-plus-glasses group had an average 20/32 vision in their lazy eye compared to an average 20/40 vision in children who received only glasses.
3. **Younger Children May Respond Better To Amblyopia Treatment.** MedPage Today (7/11, Walsh) reported, "Younger children with amblyopia respond better to treatment than do their older peers," according to a meta-analysis published online July 11 in the Archives of Ophthalmology. After examining data on some 996 children, researchers found that youngsters "younger than seven had significantly greater improvements for both moderate ( $P<0.04$ ) and severe ( $P<0.001$ ) amblyopia than did those seven to 13." And, "among the younger children, there were no significant differences in response between those ages three to five and those in the five and seven group for either moderate ( $P=0.67$ ) or severe ( $P=0.09$ ) amblyopia."
4. **Patient education sheet included in the Clinical Guide to Ophthalmic Drugs:** update this information!
  - a. Initial evaluation should be at age 6 months, not wait until 3 or 4.
  - b. Eyeglasses and patching may not be the only needed treatment: contact lenses may be more beneficial in cases of anisometropia and strabismus surgery or vision therapy may be needed to improve binocularity.
  - c. Vision can be stimulated and enhanced past 6 to 8 years of age.
5. Eye-Hand Coordination Skills in Children with and without Amblyopia- In this important research article published in *Investigative Ophthalmology and Visual Science* in March 2011, it is shown that children with amblyopia have significantly poorer "reach" and "grasp" skills compared to normally sighted children at all ages tested. It is postulated that the lack of stereopsis in amblyopic children is at the root cause of the eye-hand coordination deficits and that restoring binocularity in children with amblyopia may improve their poor eye-hand action control.

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