Amblyopia / Lazy Eye

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Greek word Amblys= “dull” ops= “eye”

- **Amblyopia** is the unilateral, or rarely bilateral, decrease in best corrected visual acuity (BCVA) caused by form vision deprivation and/or abnormal binocular interaction, for which there is no identifiable pathology of the eye or visual pathway. (From birth to 8 years of age).

- Suppression temporary active cortical inhibition of the image of an object formed at the retina of the squinting eye. (with both eyes open)

Complex visual processing disorder

- Accommodation accuracy and facility,
- Fixation stability,
- Pursuit and saccadic accuracy,
- Location in space,
- Reduce contrast sensitivity,
- Dark adaptation abnormalities,
- Visual field abnormalities,
- Occasionally relative afferent pupillary defect (RAPD).

Cont;

Normal Binocular Vision

- Our eyes work together as visual cortex integrates the images form each eye to produce a single binocular stereoscopic image.
- The cortical merging of two images is called binocular fusion

Two types

1. **Motor fusion;** Keep the eyes aligned together on a visual target
2. **Sensory fusion;** Brain merging images from each eye into single stereoscopic image

Primary brain processing centers are the lateral geniculate nucleus (LGN) & striate cortex.

Brain centers process information from more than 1 million retinal axon from each eye.

Requirement of normal visual development

- Clear retinal image
- Equal image clarity
- Proper eye alignment
- Continues clear cortical active image integration

Visual Development & Amblyopia

- At birth visual system is immature & (VA) approximately 20/400. VA improves and stereopsis develops during first months of life.
- Normally developing infants is the ability to accurately fixate **ON & follow small objects by 6 months of age .**
- **Healthy infants may occasionally show delay visual maturation.**
- **Persistence of strabismus after 3months of age may indicate ocular pathology.**
- Myelination of the optic nerves, development of the visual cortex, & growth of (LGB) occur during first two years of life.
- Fovea reaches to maturity at approximately 4 years of age.

- Prevalence of amblyopia 3% to 6%.
- Importance of detection and treatment of amblyopia
- psychological effects of amblyopia on amblyopic child & their parents.
- Self-image, work, school, & friendships were negatively impacted.
- While treatment of amblyopia has a positive impact on psychological disorders.
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RISK FACTORS TO DEVELOP AMBLYOPIA

- Low birth weight and prematurity
- Delay milestones and CNS disorders
- Positive family history
- Maternal smoking

What are the types of amblyopia?

- The nature of amblyopia differs depending on the cause:-
  - Refractive amblyopia
  - Anisometropic amblyopia
  - Meridonial amblyopia
  - Strabismic amblyopia
  - Visual deprivation amblyopia
  - Toxic amblyopia

Classification of amblyopia

Functional Amblyopia

- Not due to the diseases in the eye
- unilateral/bilateral of the eye
- Reversible
- Examples:
  - Refractive amblyopia
  - Anisometropic amblyopia
  - Meridonial amblyopia
  - Strabismic amblyopia

Structural/Pathological Amblyopia

- Due to lesion in the eye or visual pathway
- unilateral/bilateral of the eye
- Irreversible
- Examples:
  - Visual deprivation amblyopia
  - Toxic amblyopia

What are the sign and symptoms of amblyopia?

Symptoms	Signs
• No symptoms • Blurred vision • Reduced vision • Reduced contrast sensitivity	• No obvious sign, unless severe abnormality is present. • Rubbing or squinting of eyes • Misaligning eyes • Reduced VA • Droopy eyelid

Pathophysiology

- **Changes** have been found in the lateral geniculate nucleus (LGN) and visual cortex.it has been shown that amblyopic eye functions at its best in **mesopic and scotopic** conditions and at its worst under photopic conditions.

- Significant **reduction** in relative **cortical blood flow and glucose metabolism** during visual stimulation of the amblyopic eye during a position emission tomography scan.

Diagnosis

- • Visual Acuity Testing
- Preschool children, Liner acuity is more desirable than single optotype (crowding phenomena), Allen picture figures, LEA figures, HOTV, illiterate E game, wright figures.

- • Fixation testing for amblyopia
- Preverbal children monocular or binocular fixation preference
- Monocular fixation testing: normally developed child more than 2 to 3 months of age should show central fixation with accurate smooth pursuit and saccadic refixation eye movement. test for central fixation by covering one eye then move a target slowly back and forth in front of the child to observe the accuracy of fixation.

Eccentric fixation

- Extrafoveal part of the retina
- Looking to the side, not directly at the fixation target
- Poor smooth pursuits, donot accurately follow a moving target.
- Para foveal 2* off the fovea
- Para macular 2-4* from the center of fovea
- Centrocaecal > 4* b/w macula and optic disc
- Para central around the optic disc.

- **Visuscope (direct ophthalmoscope)**
- Cooperative children

Fixation behavior testing

- Moving a visual target through the child's visual space.
- Each eye tested separately.
- Accuracy is improved if the test is repeated several times.
- The ability to follow past the midline develops at approximately 2 months of age;
- vertical eye movements typically develop around 3 months.

Equal fixation prefrrence

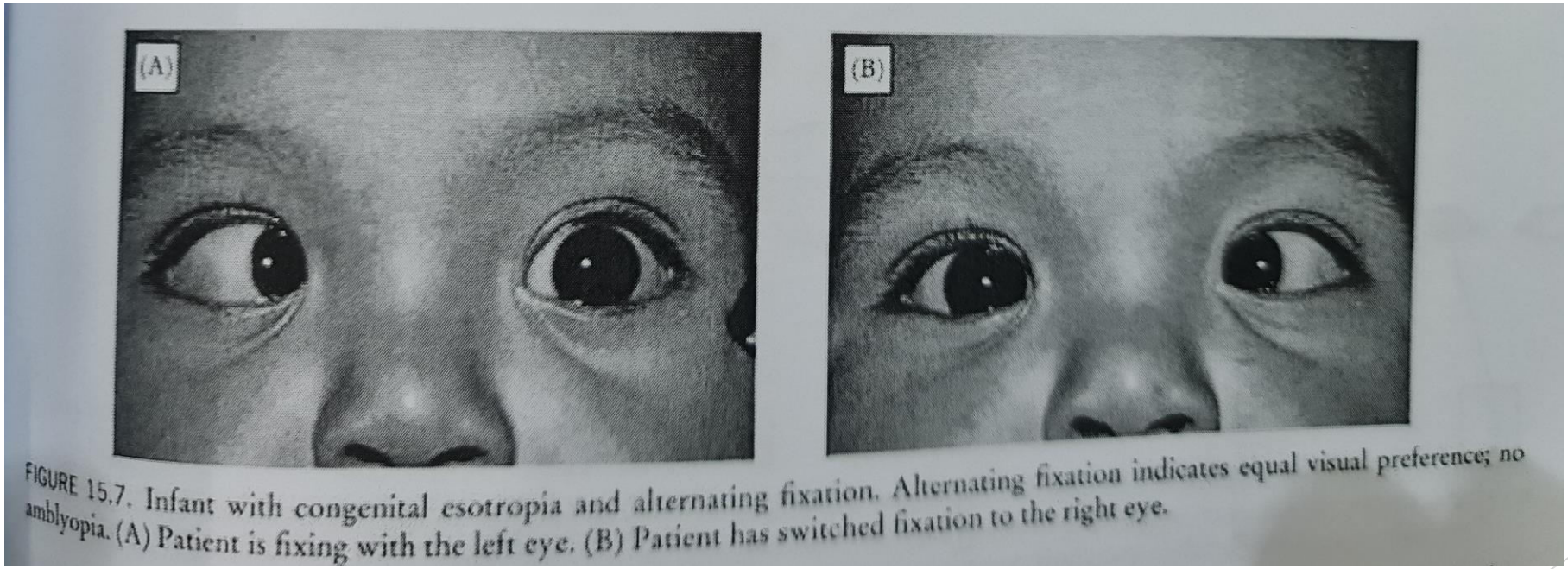
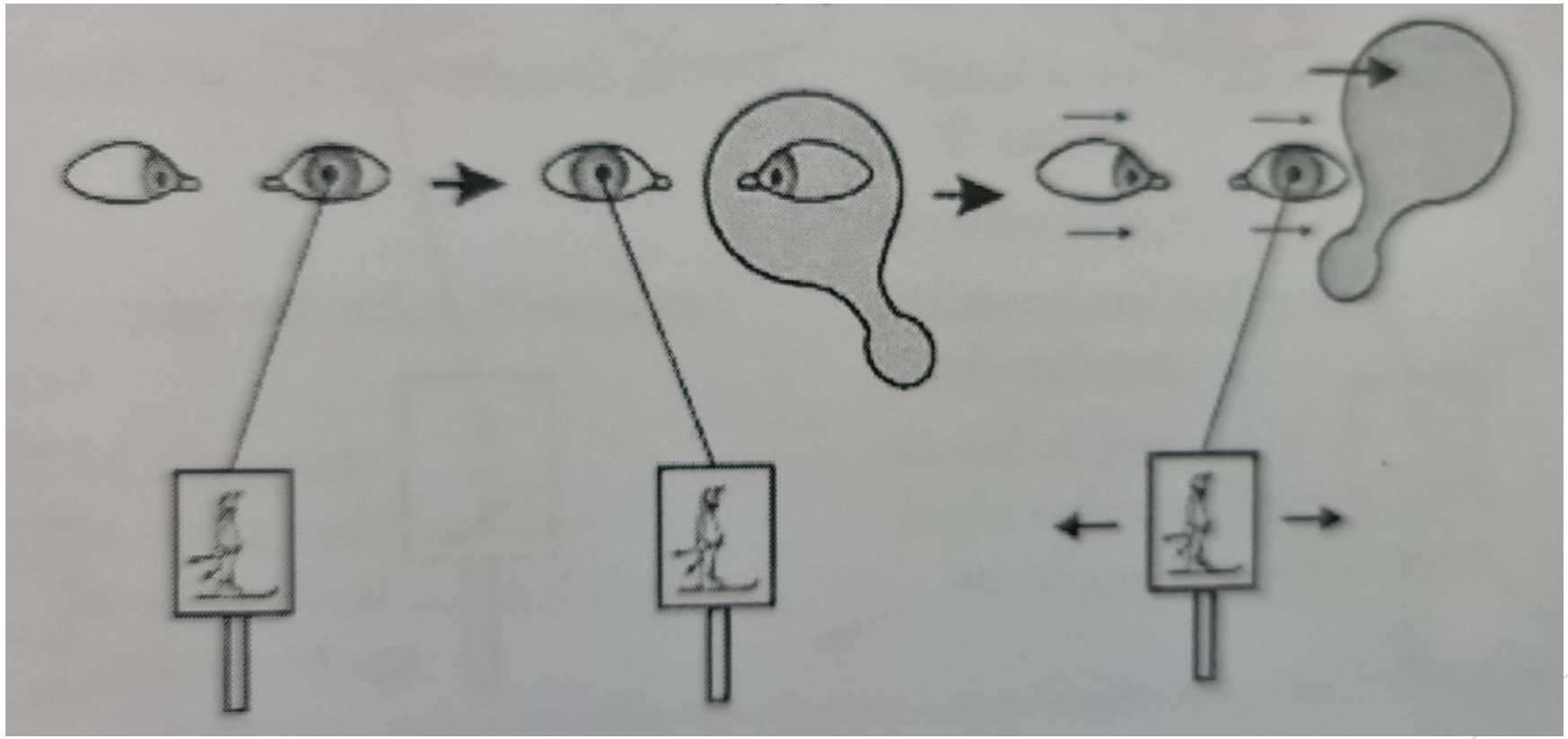


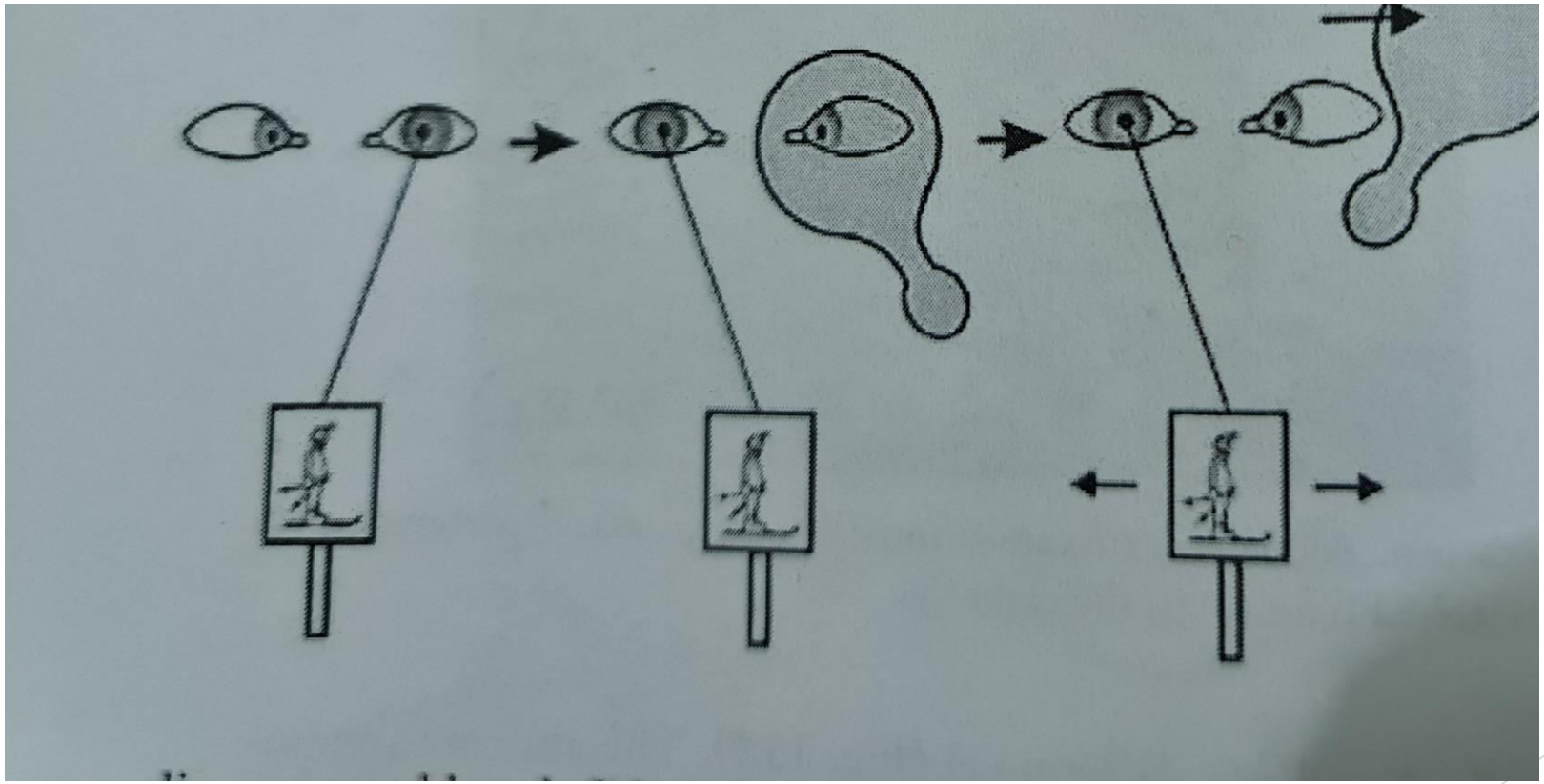
FIGURE 15.7. Infant with congenital esotropia and alternating fixation. Alternating fixation indicates equal visual preference; no amblyopia. (A) Patient is fixing with the left eye. (B) Patient has switched fixation to the right eye.

Strong fixation preference

amblyopia of the deviated eye



Non-preferred eye.
No amblyopia



Vertical prism test (induced Tropia test)
10 PD Fixation test

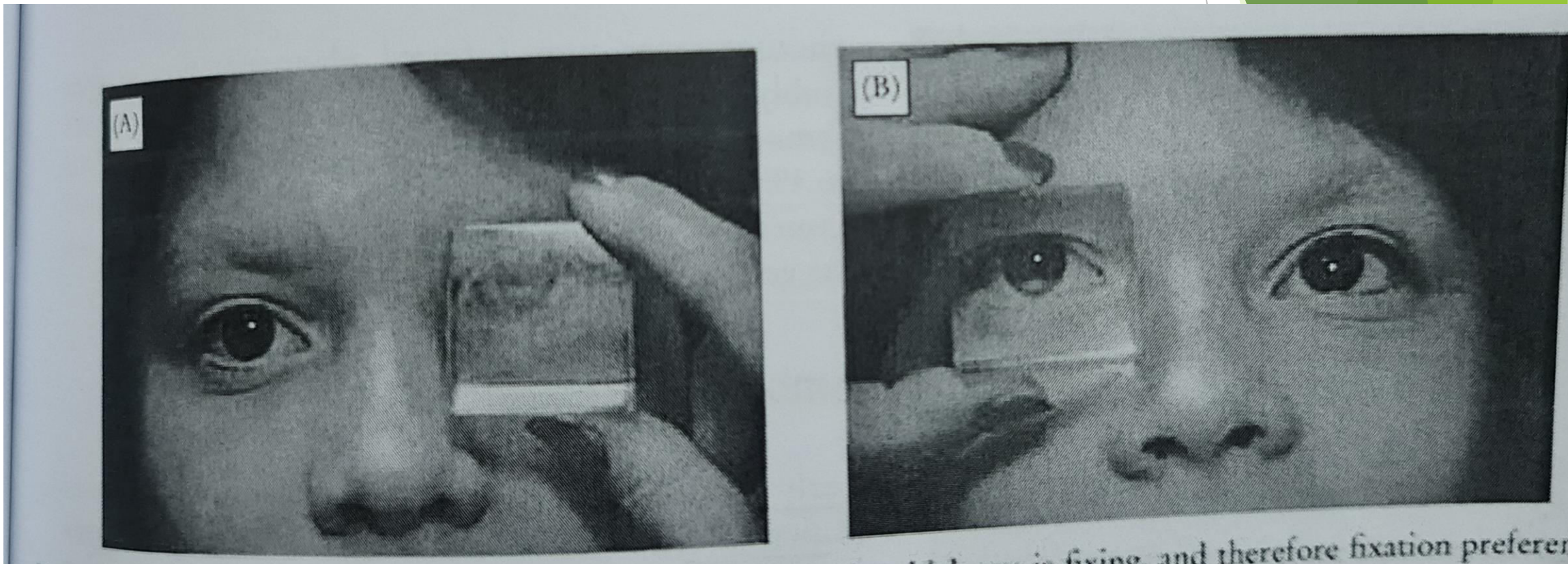


FIGURE 15.11. Vertical prism is placed in front of one eye to identify which eye is fixing, and therefore fixation preferen
determined. (A) One can identify that the right eye is fixing because the right eye is in primary position and the patient i
the vertical displaced image in the left eye. (B) Patient is still fixing with the right eye. Both eyes shift upward because the r
viewing through the prism. This is a base-down prism, so the eyes move up.

Cross-fixation

- Large angle esotropia & tight MR muscle difficulty bringing the eyes to primary position … stay adducted
- “cross fixation”
- Rt fixate on object in lt gaze
- Lt fixate on object in rt gaze
- Ability to hold fixation past midline or to hold fixation through smooth pursuit with either eye…. Equal vision

Latent nystagmus

- Pts with strabismus often have latent nystagmus, horizontal jerky nystagmus
- Occurs or get worse in both eyes if one occluded
- Occlusion of one eye increase nystagmus & diminish VA.
- Blurring of one eye induces less nystagmus than occlusion
- +5 D lens sufficient to blur distance vision
- Take binocular visual acuity measurement in addition to a monocular acuity
- In pts with nystagmus b/c binocular vision is usually better than monocular vision.

Vision Screening
I-ARM

- I INSPECTION
- A ACUITY
- R RED REFLEX
- M MOTILITY

- RED REFLEX (Bruckner test)
  - 2 feet
  - Dim light room
- Hirschberg reflex “corneal reflex”

Amblyopia Treatment
Clear Retinal Image

- Patient with bilateral hypermetropic (>+5.00 D) should receive full hypermetropic correction, as amblyopic eyes do not fully accommodate.
- Partial correction often shows very slow or no improvement in their amblyopia.
- Patient with large astigmatism (>+2.50 D) prescribe full astigmatic correction.
- If patient has anisometropic amblyopia and straight eyes, initially prescribe just glasses and wait to start patching of the good eye.
- Most anisometropic amblyopes will respond to glasses alone or with minimal part-time occlusion of the good eye.
- Children with media opacities, such as cataract, immediate surgery with visual rehabilitation using contact lens, intraocular lens.

Correct Ocular Dominance (strabismus amblyopia)

- **Occlusion**
- covering the sound eye to stimulate the amblyopic eye. Amblyopic patients with essentially straight eyes (tropia <8 PD) and peripheral fusion are best treated with part time patching (3 to 4 hours/day).
- For anisometropic amblyopia, initially prescribe spectacle correction and follow monthly for VA improvement.
- If vision does not improve on monthly follow-ups, then part time patching or penalization therapy is started, these methods help to preserve fusion.
- If vision does not improve with part time occlusion, then full time occlusion should be tried.

Penalization

- Blurring the sound eye to force fixation to the amblyopic eye.
- Penalization only works if fixation is switched from the sound eye to the amblyopic eye.
- Blurring of the sound eye can be achieved by various methods.

- Atropine penalization 0.5%, 1% usually requires +3 or more hypermetropia in the sound eye to obtain significant blur to switch fixation.
- It is important to note that blurring the sound eye to a visual acuity lower than the amblyopic eye does not guarantee a switch fixation to the amblyopic eye.

- Young children with penalization may result reverse amblyopia (decrease vision in previously good eye) patient of 4 years of age or younger should follow closely.
- The Pediatric Eye Disease Investigator Group (PEDIG) has exclusively studied the use of atropine penalization for the treatment of amblyopia.
- Results shows that treatment with patching and atropine penalization gave similar outcome.
- Prescribing proper spectacles correction alone has been shown to be highly effective in treating both strabismic but especially anisomtropic amblyopia.
- That is not to say there is no role for patchting and penalization, but to emphasize the importance of correcting the refractive error.

Occlusive contact lens

- 92% One-line improvement of Snellen acuity but complications limited its usefulness
- Conjunctival irritation, poor contact lens fitting, high recurrence to pretreatment visual acuity 55% recurrence of amblyopia.
- Occlusive contact lens should be considered as a last resort with close follow-up.

Bilateral light occlusion

- Preventive treatment of amblyopia may be the use of bilateral light occlusion.
- Its prolongs the sensitive period of visual development.
- Neonates with hyperbilirubinemia treated under bili-lights who were patched bilaterally for several days to weeks showed that they did not have an increase incidence of amblyopia or strabismus.
- In a separate report by the author, a neonates received 17 days of bilateral patching after having 2 weeks of dense vitreous hemorrhage and hyphema.

Levodopa /Carbidopa in the treatment of amblyopia 4:1 dose ratio:

- Drugs use for Parkinson's disease.
- Levodopa 1.5mg/kg/day 1 to 7 weeks 3 divided doses

Antidepressants drugs : fluoxetine

GABA antagonist & cytidine-5-diphosphocholine.

Pleoptics

- Treating eccentric fixation association with dens amblyopia.
- A bright ring of light is flashed around the fovea to temporarily “blind” or saturate the photoreceptors surrounding the fovea, which eliminates vision from eccentric fixation point and forces fixation to the fovea.
- Pleoptics treatment are given several time a week to enhance occlusion therapy.

Active stimulation

- A high contrast spinning disc with square-wave grating was one method that has been tried (CAM) to the amblyopic eye to improve vision in the amblyopic eye.

Prognosis of amblyopia

- Depends upon age of the patient,
- Compliance,
- Severity of amblyopia and
- Type of amblyopia.
- The earlier the amblyopia occurs and the longer it remains untreated, the worse the prognosis.
- Bilateral amblyopia responds better than unilateral amblyopia.
- Myopic anisometropic amblyopia respond better than hypermetropic anisometropic amblyopia

THANK YOU