Amblyopia

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What is amblyopia?

Amblyopia (sometimes referred to as "lazy eye") is a reduction in visual acuity (VA) that is not directly caused by a structural abnormality. It is a childhood condition that results from suboptimal visual experiences that alter the nerve pathways between the eye and the brain. It is traditionally defined as a difference of 2 or more lines on an acuity chart or less than 20/40 vision (with correction).[1] Amblyopia is diagnosed when an amblyogenic factor causes abnormal development of the visual cortex during a critical neural maturation stage resulting in decreased VA. It is the most common cause of visual impairment in the pediatric population affecting approximately 1 to 4 percent of children.[2] Most cases are unilateral, and frequency is the same amongst males and females. The brain begins to favor the stronger eye over the weaker, resulting in an imbalance between the eyes.[1] It is important to correct amblyopia early in life while the child's visual brain can still develop better VA.[2]

Classification of amblyopia is based on etiology: strabismus, refractive errors (such as anisometropia), and conditions leading to visual deprivation, such as clouding of the lens (cataracts) or a droopy eyelid (ptosis).[2] Treatment of amblyopia depends on the cause but typically involves forcing the patient to use their weaker eye while correcting the underlying cause of the decreased vision (cataract surgery, glasses, etc.). This "penalization" of the sound eye is typically accomplished using an eye patch or atropine drops.[1]

What causes amblyopia?

Strabismus, a condition where the eyes do not align properly, is the most common cause of amblyopia, accounting for almost half of all cases[3]. This results in two different images being sent to the brain. The brain starts to ignore the poorly focused image from the misaligned eye, which leads to reinforcement of the stronger eye. Correction of this type of amblyopia typically involves glasses and/or surgery that corrects the misalignment of the eye. Unequal refractive errors, or anisometropia, is the second most common cause of amblyopia.[2] Errors in refraction lead to a less than optimal image being sent to the brain. Again, the brain learns to "listen" to the better focused eye and the unfocused eye fails to develop (or loses) its cortical connections that allow for fine VA. In order to correct this type of amblyopia, glasses can clear the image sent to the brain from the amblyopic eye. An eye patch can be worn to block visual input to the dominant eye, thus reinforcing signals to the visual cortex from the amblyopic eye. The last type of amblyopia is known as deprivation amblyopia where structural irregularities obscure visual input. Some causes include congenital cataracts (clouding of the lens), severe ptosis (droopy eyelid), corneal opacities, and vitreous hemorrhage (blood inside of the eyeball).[2] Timely correction of the underlying defect is necessary to avoid permanent visual impairment. The older the child, the less plastic is the visual cortex. Recovery of good vision from congenital cataracts becomes unlikely after 8 weeks of age, and recovery of vision in strabismic or refractive

amblyopia becomes unlikely after around 8 years of age. The longer the condition goes untreated, the less likely is the recovery of good vision in the amblyopic eye.

How do we screen for amblyopia?

Screening and early treatment of amblyopia and its risk factors should be done at age-appropriate levels for all children in order to reduce both the incidence and severity of disease.[2] Neonates should have a red reflex checked in the newborn nursery and at every well baby check to screen for cataracts and other media opacities. Infants and children should also be screened at pediatrician checkups for aligned eyes with corneal reflexes (Bruckner test). In preverbal children, an accurate measurement of VA can be challenging, but there are some simple tests that can be performed to evaluate the VA in these children. If the child has strabismus, the fixation test can be performed.[2] It is performed by presenting a fixation target to the child and determining if their fixation alternates, or if the child will maintain fixation with the non-preferred eye after occlusion of the preferred eye. If the child does not have strabismus, then the occlusion objection test can be performed.[2] This test is done by simply occluding one eye and then the other. Children with amblyopia tend to become irritable when the dominant eye is occluded. A final test that is commonly performed for pre-verbal children is the vertical prism test. This test utilizes a 10 to 14 prism diopter vertical prism to create a vertical tropia in children without strabismus.[2] If a child refixates when one eye is covered with the prism (i.e the eyes move upward) but not the other, this signifies that they may not be seeing well out of the eye that will not refixate.

In children older than 3 years of age, screening is typically more accurate as the child can express what they are seeing. Optotypes, a series of figures and/or letters, are presented to the child, one eye at a time, who is then instructed to communicate their recognition ("read" the symbols or letters) back to the examiner.

References

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Comprehension Questions

1. What is Amblyopia?

a. Trouble seeing objects at a distance
b. Trouble seeing objects close up
c. A condition where children can only see shades of color
d. A condition where a child undergoes suboptimal visual development
e. A condition where the eye muscles become paralyzed

D. Amblyopia is a condition characterized by a reduction in visual acuity due to the abnormal development of the visual system during childhood. One or both eyes sends sub-optimal images to the brain. Over time the brain will develop better vision in the eye sending clearer images. The eye with suboptimal vision will become ignored. Early intervention is important to prevent permanent visual impairment in these children.

2. True or False: Strabismus is the most common cause of amblyopia.

True. Strabismus is the most common cause of amblyopia, accounting for approximately half of all cases. Strabismus is a condition where the eyes do not align properly. . The brain will more readily interpret the higher acuity image and develop normally for preferred eye. Over time, the eye sending fewer, less optimal images will begin to be ignored by the brain (suppression).

3. True or False: Boys are at a higher risk to develop amblyopia than girls.

False. Amblyopia occurs at equal frequency in both boys and girls. Some studies show that the left eye may be affected more often than the right.

4. When should children be screened for amblyopia? Choose the best answer.

a. Only when there is high suspicion for the disease
b. When they express that they are having a hard time seeing
c. Before their first birthday
d. At age-appropriate times during their development
e. Before age 10

D. Early detection of amblyopia is imperative in order to prevent irreversible defects in visual acuity. Any child with high risk of amblyopia, for example a child with a strong family history of the disease or those with ptosis, should be evaluated by a pediatric ophthalmologist as soon as possible.

5. True or False: A child with a visual acuity of 20/20 in the left eye and 20/50 in the right eye should receive the diagnosis of amblyopia.

False: Just because a child has a significant difference in visual acuity between eyes does not necessarily mean that the child will develop amblyopia. Certain diagnostic tests can be performed to confirm the diagnosis of amblyopia.