

AMBLYOPIA AND STRABISMUS

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AMBLYOPIA:

Definition:

Amblyopia is defined as the loss of visual acuity not correctable by glasses in an otherwise healthy eye. It is found in approximately 2% of the young adult population in the United States. Amblyopia develops in infancy or early childhood and is usually detected in very young children primarily by measuring or estimating the visual acuity. If amblyopia is detected and treated early, it can be cured.

If the treatment begins before the age of five years, the results are very good and amblyopia treatment is rarely successful, if initiated, after the age of ten. At least 50% of all patients with amblyopia also suffer from strabismus, which is misalignment of the two eyes.

The family physician or pediatrician will be first person to examine a young child with amblyopia and strabismus. In order to screen these patients properly, you must be familiar with the different kinds of amblyopia and strabismus and the close relationship of these two conditions.

Vision in children:

Vision is a developmental sensory function and at birth it is relatively poor. Through proper visual stimulation in the early months and years of life, a normal acuity is achieved at approximately three years of age. If for any reason, the stimulation of the vision receptive cells is prevented because of strabismus, abnormal refractive error, congenital cataract or some other conditions, vision will not develop properly. This is a failure of the developmental process and not an organic abnormality of the eye.

Types of Amblyopia:

The various types of amblyopia are:

- (1) Strabismic
- (2) Refractive
- (3) Form deprivation
- (4) Occlusion

As I have mentioned before, amblyopia is disruption of normal development of vision and has to be distinguished from a loss vision from an organic cause such as cataract, retinoblastoma, inflammatory and congenital disorders. It is usually unilateral but can rarely affect both eyes. Amblyopia does not cause learning disorders.

Amblyopia usually develops when visual information received from one eye is clear as compared to the visual information received from the other eye, which is blurred. The child's brain then selects the better image. The brain suppresses the blurred image or the conflicting image, resulting in faulty development of vision in the eye with blurred image. In other words, you can say that the brain favors the eye with the better vision and visual cells responsible for vision of the eye with the blurred vision do not develop normally.

Now, I will discuss the various types of amblyopia.

Strabismic Amblyopia:

When a child has strabismus, that is misalignment of the eyes, the fixating eye will develop normal vision but the brain will ignore the image from the strabismic eye, which is the eye, which is turned.

When the strabismus occurs in an adult, it will generally produce diplopia because the two eyes are not aligned on the same object. In a child the brain is more adaptive and ignores the image from one of the eyes, usually the one, which produces the blurred image, this overcomes troublesome symptoms of diplopia. This cortical suppression of sensory input from one eye may interrupt the normal development of vision in the higher centers of the brains thus producing reduced vision and amblyopia.

Sometimes the degree of misalignment is very small and detection is difficult. This small angle strabismus may cause very dense amblyopia.

The treatment of strabismic amblyopia will be to rectify and treat strabismus, either by way of prescription of glasses, surgery and patching. I will be dealing with the treatment of strabismus subsequently in this lecture.

Refractive Amblyopia:

Amblyopia can result when there is a difference in the refractive error between the two eyes. This is also termed as anisometropia. The eye with lesser amount of refractive error provides a clearer image and the brain usually favors the eye with the better vision and suppresses the other eye with a blurred vision thus producing amblyopia.

Children with anisometropic hyperopia are more susceptible to develop amblyopia because unequal accommodation is impossible since the child can only bring one eye at a time into focus. Refractive amblyopia is as severe as strabismic amblyopia. This kind is usually missed. The diagnosis is difficult because there is no obvious strabismus. The diagnosis of refractive amblyopia is possible when the visual acuity is tested and wide disparity of the visual acuity is detected in the two eyes.

The treatment of refractive amblyopia is correction of the refractive error at an early age and/or patching.

Form Deprivation and Occlusion Amblyopia:

Amblyopia- exanopsia or form deprivation amblyopia can result when there are opacities of the ocular media such as cataracts or corneal scarring, which prevents adequate sensory input thus disrupting visual development. Amblyopia can persist when the cause of the media opacity is removed. Sometimes a ptosis, that is drooping of the upper eyelid or an acute chalazion, that is a cyst of the meibomian gland of the upper lid, can produce drooping of the lid thus occluding the vision of a child and produce amblyopia very quickly. Sometimes when patching is prolonged to treat amblyopia, it can produce amblyopia in the eye being patched. This is termed as reverse amblyopia. The treatment of form deprivation or occlusion amblyopia will be to remove the cause at the earliest possible opportunity.

Amblyopia Testing:

As mentioned earlier, amblyopia can be detected by testing the visual acuity in each eye separately. In a newborn, true visual acuity cannot be measured. However the ocular status should be assessed through corneal light reflex, evaluation of the red reflex, pupillary testing and if possible a fundus examination.

Infants to two years of age:

In this age group, the visual acuity can not be measured, but the visual function can be assessed.

You should try to cover each eye in turn with the hand or an adhesive patch and see how the child reacts. If amblyopia is present, the children will likely protest vocally or by evasive movements when the good eye is covered.

Visual function can also be assessed by passing an object of interest before the baby and noting how the infant watches or follows the object. If you are unable to make the child follow the object of interest, then you can move the child's head from side to side to elicit a "dolls eye movement".

Age two to five years:

At this age group, a picture card or a tumbling "E" chart can be used to measure the visual acuity.

As a family physician, you should know when to refer a child who may develop amblyopia.

You should always refer any child with strabismus, unequal visual acuity in the two eyes, cataracts or any opacity in the media, Ptosis, (drooping of the upper eyelid) or any acute lesion of the upper eyelid. Most importantly, you should refer at a very earlier stage.

As you know success of the treatment depends on the age of the patient at which the treatment is instituted - the earlier, the better. Amblyopia treatment is rarely successful beyond the age of ten years. Patient compliance and parental cooperation also become extremely important in the success of the treatment for amblyopia. I have frequently seen instances where the child protests and does not want to wear the patch, as the child does not see properly from the amblyopic eye. The purpose of the patch is to force the amblyopic eye to see. I have also seen cases where a number of parents do not want their child to wear glasses or do not want to patch the eye of the child. In a nutshell, the buzzword for treating and success of the amblyopia is

Early, Early and Early.

STRABISMUS:

Definition:

Strabismus is defined as misalignment of the two eyes in that both eyes cannot be directed towards the same object of regard. Strabismus may be caused by the absence of binocular vision as with amblyopia. Strabismus does not cause learning disabilities.

Clinically strabismus can be classified as:

1. Concomitant
2. Non-paralytic and Incomitant or paralytic strabismus.

Strabismus is called concomitant or non-paralytic when the angle or degree of misalignment is approximately equal in all directions of gaze. The individual extraocular muscles function

normally and the two eyes are not directed towards the same object. Concomitant strabismus occurs in childhood and often causes suppression of the image to overcome the double vision, leading to strabismic amblyopia, which I have already discussed.

Concomitant strabismus in patients, under age six, is rarely caused by serious neurologic disease. As compared to strabismus arising later in life, it may have specific and serious neurological basis. In an adult, loss of vision from an intraocular or optic nerve disease can also cause concomitant strabismus.

A blind eye in an adult frequently drifts outwards, whereas a blind eye in a child will turn inwards.

Incomitant Strabismus:

Strabismus is called, Incomitant, paralytic or restrictive when the degree of misalignment varies with the direction of gaze. In this, one or more extraocular muscles or nerves may not be functioning properly or normal movement may be mechanically restricted. This may indicate a third, fourth or sixth cranial nerve palsy. This can also happen in orbital trauma - for instance a blowout fracture of the orbit or restrictive thyroid ophthalmopathy.

There are various other terms used in strabismus such as Heterophoria and Heterotropia. Heterophoria is a latent tendency for misalignment of the two eyes, which becomes manifest only if binocular vision is interrupted such as by covering one eye. In heterophoria, when both eyes are open and directed at the same object, the two eyes are perfectly aligned. However, when one eye is covered the eye will drift to its position of rest and once the cover is removed, the eye will realign itself with the other. A minor degree of heterophoria is normal for most individuals.

Heterotropia is another term for strabismus. Heterotropia and heterophoria can be further subdivided according to direction of the deviation involved. In esotropia, the eye is turned in. In exotropia, the eye is turned out; in hypertropia, the eyes turn up and in hypotropia the eye is turned downward.

In a patient the usual complaints are that the eyes are turned either inwards, outwards, upwards or downwards and there may be loss of vision in one eye. They usually have loss of binocular vision. The children with strabismus do not have diplopia or double vision, as they suppress the vision from the deviating eye.

Diagnosis and Testing for Strabismus:

As a family physician, you can ensure that the child's vision is developing normally by regular screening of the vision in young children. As a minimum, all children should undergo an evaluation to detect eye and vision abnormality during the first few months of life and again at about three years of age.

Strabismus can be detected by general inspection of the eyes, corneal light reflex or the cover test.

In the general inspection, you should test the extraocular muscles by moving an object or a light in front of the child's eye. You should also look for nystagmus, that is jerky movements of the eye or an abnormal head posture - either a tilt or turn of the face. All infants or children with nystagmus must be examined and followed by an ophthalmologist.

Corneal Light Reflex:

With the corneal light reflex, the patient is directed to look at a penlight held directly in front of the eyes by the examiner at a distance of about two feet. The examiner aligns his/her eyes with the light source and compares the position of the light, as it is reflected by the cornea of each eye. In a deviating eye, the light reflection will be eccentrically positioned. The corneal light reflex may be the only feasible method of testing in newborns and often in children.

Cover test:

The cover test is easy to perform and requires no special equipment. It can detect almost every type of tropia or phoria. It can be used on any patient over the age of six or seven months. To perform the test, have the patient look at a fixation point such as a detailed or interesting target.

You should note which eye seems to be the fixating eye. Cover the fixating eye and observe the other eye. If the uncovered eye moves to pick up the fixation, then it can be reasoned that this eye was not directed towards the object of regard. If the eye moves inward to fixate, then originally it must have deviated outwards and hence it is exotropic. If the eye moves outwards to fixate, then it was deviated inwards and is esotropic. A small angle esotropia may be difficult to detect by evaluating the corneal reflex or the cover test and for this reason, visual acuity testing is important in all cases of suspected strabismus and for detection of amblyopia.

Other tests, which are useful in strabismus, will be the pupillary testing, red reflex and ophthalmoscopy. An abnormal pupillary response may indicate a neurological disease or other ocular defects.

Red Reflex:

Light is reflected off the fundus as red and when examined through the ophthalmoscope at a distance of approximately one-foot, red reflex is seen. Any media opacities in the red reflex appear as black.

A white reflex or a white pupil also called leukocoria may signify the presence of a cataract or retinoblastoma. To elicit the red reflex, the pupil should be dilated either with 1% Phenylephrine or 0.2% Cyclopentolate. If you cannot elicit a red reflex, the child or infant should be referred to an ophthalmologist urgently.

Ophthalmoscopy:

A careful ophthalmoscopic examination of both eyes through dilated pupil is mandatory for any patient with reduced vision or strabismus, as this may be the only way that a physician can detect potentially serious intraocular lesions such as cataracts or a retinoblastoma.

The treatment for strabismus will include patching to avoid and treat amblyopia.

Glasses, if there is an accommodative element or any significant refractive error. Both patching and glasses may have to be combined. Surgery for strabismus will be indicated if glasses do not rectify the strabismus. However it must be stressed that surgery is not an alternative to glasses and patching when amblyopia is present. There is no role of vision training or exercises in the treatment of amblyopia or strabismus.

To re-cap - when to refer a patient for strabismus:

1. Occasional deviation of the eye beyond three to four months of age.
2. Constant deviation at any age.
3. Any child with Nystagmus.
4. Pseudo-strabismus, which can be present with epicanthal folds, flat bridge of the nose or widely separated eyes. A true strabismus can also be associated with a pseudo-strabismus.
5. You should remember to detect amblyopia early, vision testing is very important and serious organic disease can also cause strabismus.