**Ambylopia and Strabismus**

Ambylopia is defined as a loss of visual acuity, in one or both eyes, without an identifiable organic lesion of the visual pathways, occurring during the critical period of early visual development. If detected at an early stage, it can be cured. Treatment must begin before the age of 10 and before the age of 5 for best results. Approximately 50% of patients with ambylopia have strabismus also.

Vision at birth is relatively poor and normal visual acuity develops at approximately 3 years of age. If the development of normal vision in the brain is impaired because of strabismus, refractive errors, congenital cataracts, or other conditions vision will not develop properly.

Ambylopia develops due to conflicting visual information between the two eyes. The brain automatically selects the best visual image from one eye and consequently suppresses the conflicting information from the other eye. Thus the brain favours development of the region of the brain specific for the “better” eye.

**Strabismic Ambylopia**

The adaptive brain of the child in strabismic ambylopia suppresses the image from one of the eyes (usually the blurry eye). This process alters the normal development of binocular vision which may result in reduced vision. Even with a small angle of strabismus, ambylopia may be quite pronounced. In an adult, strabismus usually causes diplopia because the visual pathways have already been established. Treating strabismic ambylopia involves correcting any refractive error and patching the normal eye and/or surgery to correct any deviation.

**Refractive Ambylopia**

Ambylopia may also result from a difference in refractive error between the two eyes. The less clear image is then suppressed and ambylopia develops. Those children who have asymmetric hyperopia are more susceptible because unequal accommodation is not possible, thus ambylopia develops. Detection is through visual acuity testing which must be properly performed as refractive amblyopia can be as severe as strabismic ambylopia. Visual acuity testing for children is as follows:

- Up to 2 years of age - Doll’s eye movements
- Age 2-5 years - Tumbling E chart
- Age 5 and up - Snellen Chart
Form-Deprivation and Occlusion Ambylopia

This type of ambylopia develops because of a lack of visual information due to congenital cataracts, corneal scarring, or anything preventing visual information from reaching the retina. Rarely, reverse occlusion can occur as a result of treating ambylopia by patching the normal eye.

Strabismus

Strabismus is misalignment of the two eyes such that they cannot both be directed towards the same object. In the absence of strabismus the eyes are directed towards the same object. Their movements are coordinated so that the retinal images of an object fall on corresponding points of each retina. These images are fused centrally, so that they are interpreted by the brain as a single image. This is termed binocular single vision. Because each eye views an object from a different angle, the retinal images do not correspond precisely; the closer the object the greater the disparity. These differences allow a three dimensional perception to be constructed. This is termed stereopsis. The development of stereopsis requires that eye movements and visual alignment are coordinated in approximately the first five years of life.

Advantages of binocular vision:

- increase field of vision
- eliminate the blind spot
- provide binocular acuity which is greater than monocular acuity
- stereopsis provided depth perception

Concomitant (nonparalytic) Strabismus

This type of strabismus occurs when the angle of misalignment is approximately equal in all directions of gaze. Simply put, the eyes are misaligned with properly functioning extraocular muscles. The angle of deviation is constant and unrelated to the direction of gaze. Strabismus occurring later in life is usually caused by serious neurologic disease. In adults, a blind eye will frequently drift outwards while in children the eye usually deviates inward.

Incomitant (paralytic) Strabismus

In incomitant strabismus there is underaction of one or more of the eye muscles due to a nerve palsy, extraocular muscle disease or tethering of the globe. The size of the strabismus is dependent on the direction of gaze and, for a nerve palsy, is the greatest in the field of action of the affected muscle.
Diagnosis of these conditions involves the following:

- inspection (extraocular movements, nystagmus, head posture)
- visual acuity
- cover/uncover test (over the age of 7 months)
- corneal light reflex

Treatment of Strabismus may include the following:

- patching
- glasses
- both
- surgery
- no role for vision training exercises

**Heterophoria and Heterotropia**

Heterotropia is a manifest tendency for misalignment of the two eyes (strabismus). Heterophoria is a latent tendency for misalignment of the two eyes only when binocular vision has been interrupted. In this situation, when one eye is covered that eye will drift either outwards (exophoria), inwards (esophoria), upwards (hyperphoria), or downwards (hypophoria). When the cover is removed the eye will align to a position of rest with normal binocular vision. Heterophoria may be diagnosed using the alternate cover test while a heterotropia is diagnosed using the cover/uncover test.

**Pediatric Vision Testing**

Every child should undergo vision testing during the first few months of life and then again at three years to detect serious vision impairing conditions such as congenital cataract, amblyopia and strabismus but also for life-threatening diseases such as retinoblastoma.

**Newborns**

Visual status should be assessed via the corneal light reflex test, red reflex, pupillary testing, and fundus examination.
**Infants to 2-year olds**

Only visual function may be accurately determined in this age group. Test for amblyopia by covering one eye and observing the child's reaction. If the “good” eye is covered the child will likely become anxious and protest either verbally or physically. Passing an interesting object in front of a child may also be done to assess ocular motility.

**Age 2 to 5**

Between 2 and 3 years of age, a picture card may be used to determine visual acuity while after this, a tumbling e chart should be used.