

STRABISMUS

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Strabismus (squint) is a condition in which there is a misalignment of the visual axes, resulting in partial or total loss of stereo vision and binocular depth perception. This misalignment can be in a form of manifest (heterotropia) or latent (heterophoria) strabismus.

A *manifest deviation* is when the eye is deviated constantly (all the time) or intermittently (occasionally). With intermittent strabismus, the deviation is more obvious during stressful situations or when the patient is ill. A *latent deviation* is when the deviation is controlled by fusion reflex and is only apparent upon dissociation. If no deviation of the visual axes is detected upon dissociation or when fusion is suspended, the patient is termed *orthophoric*¹.

Strabismus is essentially divided into 2 major groups – horizontal and vertical. They are further sub-divided into eso deviations and exo deviations for horizontal group and hyper deviations and hypo deviations for the vertical group (Figure 1).

Each of these sub categories may be further divided into:

- κ Primary – deviation due to muscle imbalance
- κ Secondary – deviation due to severe visual loss

- κ **Comitancy** – when a strabismus is deemed as comitant, it means that the angle of the deviation is equal in the 9 cardinal positions of gaze. These deviations are usually of unknown causes.
- κ **Incomitancy** – this describes a deviation that is worse in one or a few cardinal positions of gaze than other positions. This is usually due to neuro-paralytical palsies, namely palsy of the cranial nerves 3, 4 or 6, myogenic palsies e.g. myasthenia gravis and thyroid eye disease, or mechanical e.g. from trauma to the eye. This would indicate a greater urgency for prompt treatment by the ophthalmologists/neurologists.

Clinical Significance of Strabismus

- κ **Binocular visual acuity:** the patient is able to have better visual acuity when he/she is binocular i.e. no strabismus.
- κ **Stereopsis:** stereopsis is defined as the ability to fuse two disparate images together so that depth can be appreciated. With strabismus, the eyes are misaligned, therefore the patient is unable to fuse the images, now that they are further separated by the deviation.
- κ **Amblyopia:** as strabismus can lead to amblyopia in children, it is important to be able to detect its presence in early childhood. Amblyopia,

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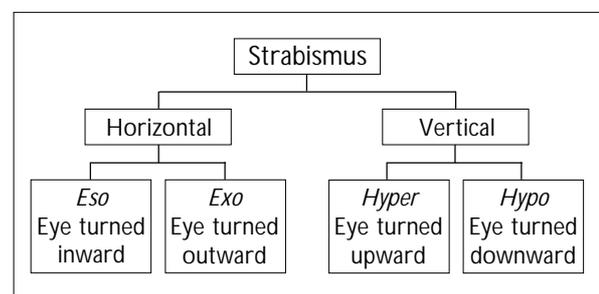


Figure 1

commonly known as lazy eye, is defined as reduced vision in one or two eyes, which is uncorrectable by optical aids as a result of incomplete visual stimulus to the brain in early childhood. GPs should screen all children under their care annually for visual acuity and strabismus.

- κ Visual Field: a patient with a constant esotropia will have a constricted visual field. Therefore, if the onset is relatively recent, the patient may be able to regain his normal visual field with early treatment.
- κ Eye contact: the loss of eye contact will cause a psychological effect on the patient as well as the people that he/she is speaking to.
- κ Cosmesis: patients with strabismus are often concerned about the way they look and this could have an effect on their self-esteem.

Assessment of Strabismus

The main methods of detecting strabismus are by:

- κ Patient's appearance
 - By observing for misalignment of the visual axes (Figure 2) and anomalous head posture for example: face turn or head tilt.



Figure 2



Figure 3

- Other common signs and symptoms are as below (the first two signs are more applicable for young patients):-
 - ρ Constant blinking and rubbing of eyes (more often in exo deviation)
 - ρ Occluding of one eye (by use of hand or closing of one eyelid)
 - ρ Recent onset of double vision.
- κ Position of corneal reflection (Hirschberg's test)
 - Corneal reflection is observed with both eyes open while patient fixates at a pen light at 33cm distance. The position of the corneal reflection is measured by the angle between the visual axis (angle kappa) and central pupillary line¹. Corneal reflection is relatively central in an orthophoric patient. When there is significant deviation, the corneal reflection in the deviated eye will be temporal in esotropia, nasal in exotropia (Figure 3), superior in hypotropia and inferior in hypertropia.

κ Cover Test

- It is an objective dissociative test to elicit the presence of a manifest or latent deviation. It relies on the observation of the covered and uncovered eye while fixation is maintained. It is done at both near (33cm) and distance (6m). The cover test is a more sensitive and accurate test in detecting a strabismus, but this test requires some skills in obtaining a reliable result, especially from children.

– Cover –uncover

When one eye is covered with an opaque occluder, the uncovered eye is observed. A manifest deviation is present when the

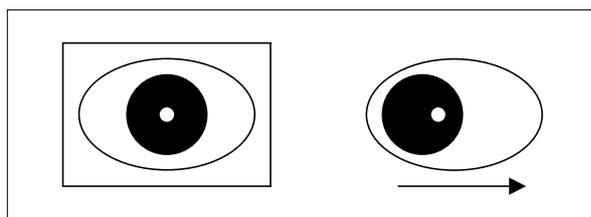


Figure 4

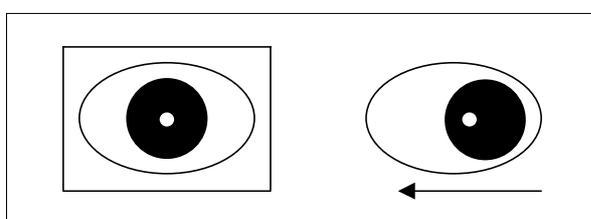


Figure 5

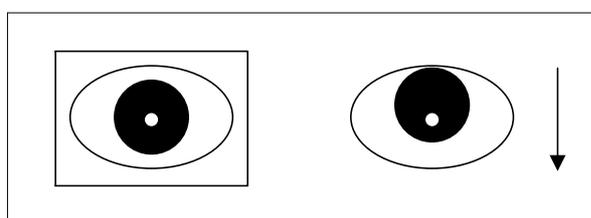


Figure 6

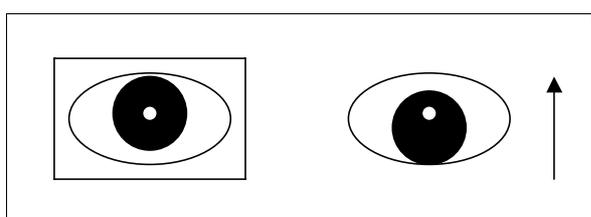


Figure 7

uncovered eye moves to take up fixation. For example:

- Temporal movement (eye moves out) indicates a convergent (eso) deviation (Figure 4)
- Nasal movement (eye moves in) indicates a divergent (exo) deviation (Figure 5)
- Downward movement indicates an upward (hyper) deviation (Figure 6)
- Upward movement indicates a downward (hypo) deviation (Figure 7).

The test is then repeated with the other eye.

– *Alternate Cover Test (ACT)*

When no deviation is detected on cover – uncover, the ACT is performed in order to detect the presence of a latent deviation. The movement of the cover is shifted swiftly from one eye to the other while observing for movement of the uncovered eye to resume fixation. If no movement is demonstrated, the patient is termed orthophoric. As an ACT does not differentiate a tropia from a phoria, it is important to perform the cover – uncover prior to the ACT. An ACT however, does bring out the full extent of both the phoria and tropia component as it totally dissociates the eyes. Therefore, the deviation may appear larger on ACT than on cover – uncover testing.

Pseudostrabismus (the appearance of a squint), rather common in young oriental children, is often misdiagnosed as a true squint. Pseudostrabismus is differentiated from true strabismus by the above methods, principally the corneal reflections, cover test and the presence of binocular function. One of the main factors causing pseudostrabismus is the wide epicanthal fold covering the inner canthi, giving the appearance of pseudoesotropia (Figure 8).



Figure 8

κ Ocular Movement

- During ocular examination, integrity of the ocular movements should be assessed. It is to establish the extent of movement in each eye and to investigate for incomitancy and extraocular muscle dysfunction. Ocular movement is tested at 33cm with a pen torch. The pen torch is moved in the 9 cardinal position of gaze and the patient is told to follow it binocularly with minimal head movement. Any under-action and over-action of muscles and asymmetrical patterns should be noted.

As mentioned earlier, early diagnosis is important in children to ensure that there is no disruption in achieving binocular single vision (BSV). BSV is the ability to use both the eyes simultaneously to perceive a single image². Normal BSV occurs with bifoveal fixation and normal retinal correspondence². Bifoveal fixation allows the brain to fuse the two images (one from each eye) into a single 3-dimensional image. This is known as stereopsis. As strabismus can cause amblyopia, the brain of the child will learn to recognise the stronger image and ignore the weaker image of the amblyopic eye. This will eventually cause a loss of depth perception. However, if strabismus develops in an adult, they will often complain of double vision because the brain has been “trained” to receive images from both eyes.

Stereopsis can be clinically tested using the Lang Stereotest. The theory behind is that the test plate consists of fine gratings that dissociate the image, so that one is seen by the right eye and the other by the left eye. This produces disparity of viewing, as both eyes will see different images. With

stereopsis, these disparate images are fused and depth is appreciated. The Lang stereotest card must be held at a normal reading distance, parallel to the patient’s face and the patient is asked to point and name the simple picture. The first Lang stereotest consists of three images – cat, car and star, while the second Lang stereotest consists of four images – elephant, car, moon and star. The star is a control image and can be seen in the absence of stereopsis. The disparity created is quite gross ranging from 1200 to 200 seconds of arc. Other stereo tests include the Titmus Fly, Frisby and the TNO.

Recording of Strabismus

Some points to look out for when recording a strabismus:

- κ Onset of the deviation
- κ The estimated size of the deviation e.g. small, moderate or large
- κ The eye that is deviated e.g. right or left
- κ The constancy of the deviation e.g. if the deviation is always manifested or it only manifests once in a while
- κ If the deviation is greater for near or far distances

These will give the examiner as well as the parents/patient an idea of the extent of the deviation and the urgency for treatment.

CONCLUSION

As strabismus can occur at any age, GPs should screen the children under their care annually. Children with eye deviations should be referred to an ophthalmologist for further management to reduce the risks of amblyopia and loss of stereopsis. Children that are born with a

constant squint should seek treatment as soon as possible to encourage the development of binocular vision. As binocular vision develops in a child during his first two years of life, a child with a congenital squint that is treated prior to above age has better prognosis of developing some form of stereopsis. For any patient that has a recently acquired deviation, it is crucial that he/she be

referred to an ophthalmologist soon to exclude any neurological or pathological problems.

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