

### **Binocular vision:**

The ability to maintain visual focus on an object with both eyes, creating a single visual image. Lack of binocular vision is normal in infants.

Adults without binocular vision experience distortions (تشوه) in depth perception and visual measurement

The advantages of having two eyes rather than just one.<sup>[1]</sup>

1. It gives a creature a "spare eye" in case one is damaged.
2. It gives a wider **field of view**.
3. It can give **stereopsis depth perception**.
4. It gives **binocular summation** in which the ability to detect faint (خافت، باهت) objects is enhanced.

### **Binocular Vision Disorder**

Binocular vision anomalies are among the most common visual disorders.

They are usually associated with symptoms such as

headaches,

eye strain,

eye pain,

blurred vision,

and occasionally double vision.

### **Causes of loss of binocular vision:**

There are many reasons binocular vision might become reduced or lost altogether, including:

1-Reduced vision in one eye

2-Loss of coordination of movement between the two eyes  
(strabismus)

3- Problems with the brain comparing images from both eyes



## Symptoms of heterophoria

**1-Symptoms of muscular fatigue:** These result due to continuous use of reserve neuromuscular power. Common symptoms are

- Headache.
- eyestrain.
- Photophobia (increased sensitivity to light).
- Difficulty in changing focus from near to distance .

**2-Symptoms due to failure in maintaining binocular single vision (BSV):** These are

- 1- Blurring of vision.
- 2- Crowding of words while reading.
- 3- Difficulty with stereopsis.
- 4- Intermittent diplopia.
- 5- Intermittent squint without diplopia.

## Diagnosis

There are different methods for diagnosis of heterophorias.. Heterophoria may be as large as  $25^{\circ}$  and heterotropia may be as small as  $5^{\circ}$  (microtropia).

**1-Cover- Uncover test:** It should be performed for both distance and near. One eye of the patient is covered while fixating with other eye at a distant target.

2-Alternate cover test: The alternate cover test induces dissociation to reveal total deviation when fusion is disrupted.

3- Maddox rod test: The Maddox rod consists of a series of fused cylindrical red glass rods that convert the appearance of a white spot of light in to a red streak.

4- **Maddox wing test:** This is used to measure degree of heterophoria at near fixation.

**5-Synoptophore:** This may also be used to measure degree of heterophoria.

## heterotropia

failure of the visual axes to remain parallel when fusion is possible.

Its a vision problem in which both eyes do not look at the same point at the same time. Strabismus most often begins in early childhood. It is sometimes called crossed-eyes, walleye, or squint.

### manifest squint (heterotropia)

The constant or intermittent deviation of the visual axis of one eye from the point of fixation, which is seen with both eyes open.

this condition in which the lines of sight of the two eyes are not directed towards the same fixation point when the subject is actively fixating an object

### causes

1-Congenital causes include anomalies in muscle attachments.

2-Acquired causes include closed head trauma, orbital tumors,

3-systemic diseases such as multiple sclerosis, Grave's disease, and myasthenia gravis.

### Investigations

1- prism

2- cover measurements.

Heterotropia is most commonly due to superior oblique paresis.

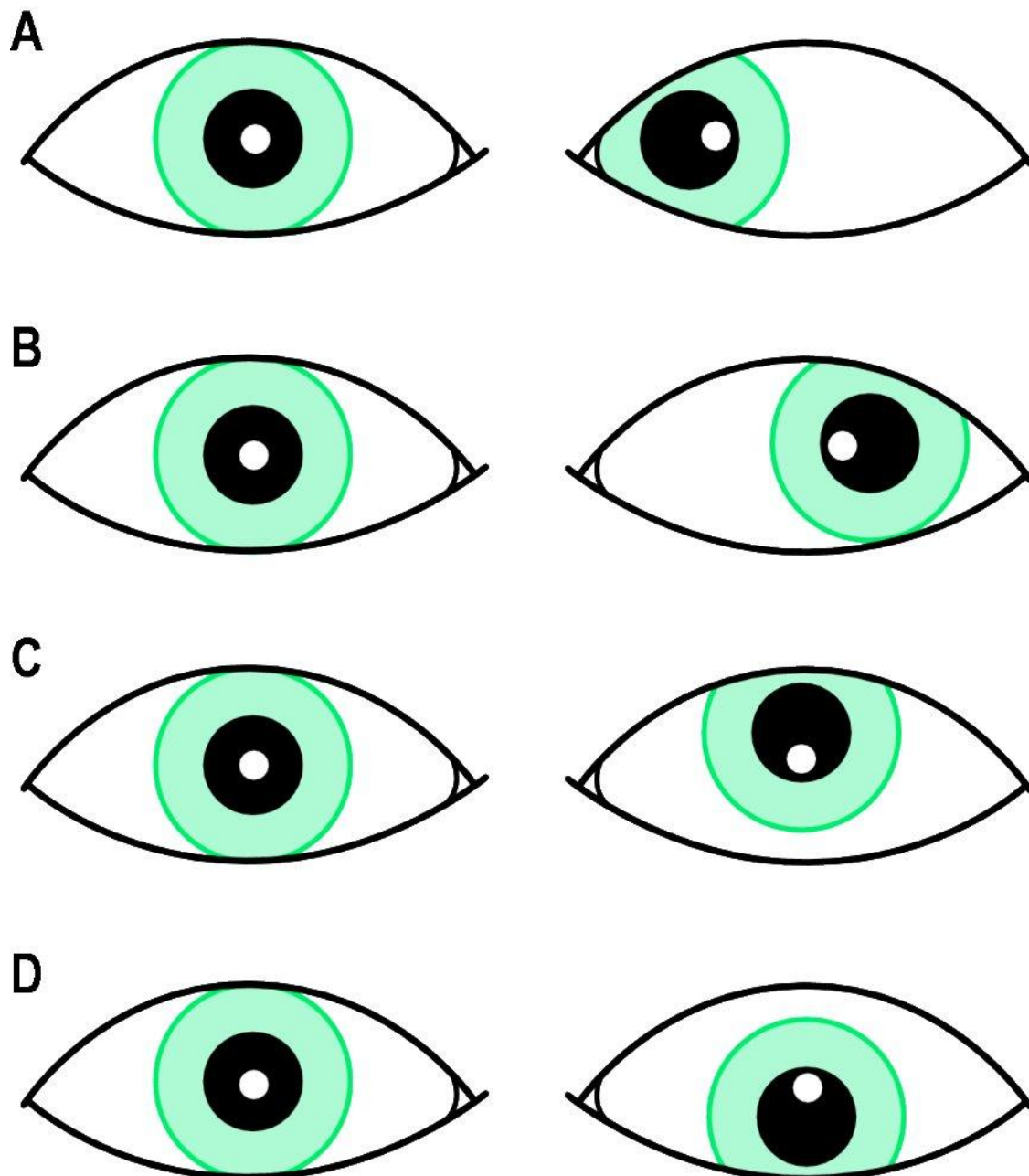
شلل العضلة العلوية المائلة

### Treatment

1-A spectacle prism

2-occlusion of one eye may be sufficient to correct minor and less non-concomitant deviations.

3- Surgery is indicated if these are unsuccessful. Adjustable sutures are often used since great precision is usually necessary.



الصورة تعني حسب التوضيح

A left convergent strabismus; B, left divergent strabismus; C, left hypertropia; D, left hypotropia

## Esotropia

Esotropia

is a condition where one or both eyes turn inward. The term derives from Greek, where 'eso-' means 'inward,' and 'trope' means 'turn.'

People with esotropia tend to have one of their eyes facing inwards, rather than facing forward in a straight direction

Esotropia can take several forms, with some types developing in infancy and others occurring in adulthood

### complications infants and children

1-Inability to process 3-D vision( فقدان خاصية التجسيم ثلاثية الابعاد)

- 2-Loss of thorough image perception( فقدان الشعور بالاشياء المحيطه بوجود الضوء)
- 3-Developing amblyopia – a condition which involves the decrease of clear vision in the child's crossed eye

### complications older children and adults

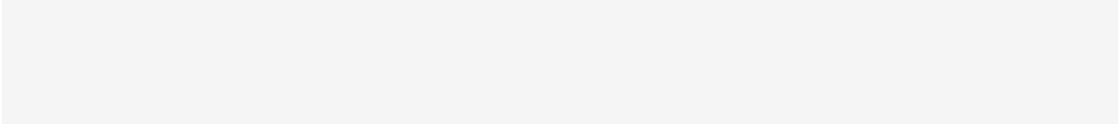
- Seeing double (diplopia)
- Problems with seeing images in depth and with clarity
- A decrease in binocular vision

## **Types of esotropia**

**These are some types of esotropia:**

- **Accommodative esotropia** is when the eyes turn inward when attempting to focus on nearby objects. This is often seen in people with hypermetropia (farsightedness).
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- **Alternating esotropia** is when the left and right eyes take turns to look inward.



- **Intermittent esotropia** is when the condition comes and goes depending on what the person is focusing on and how tired they are.
  - **Left esotropia** is when the left eye turns inwards.
  
  - **Right esotropia** is when the right eye turns inwards.
  
  - **Acute esotropia** is when the condition arises suddenly, rather than being present from birth.
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# Accommodative Esotropia

## WHAT IS ACCOMMODATIVE ESOTROPIA?

Accommodative esotropia, or refractive esotropia, is one of the most common forms of esotropia (crossed eye), which is a type of [strabismus](#), or eye misalignment. It refers to eye crossing that is caused by the focusing efforts of the eyes as they try to see clearly. Patients with refractive esotropia are typically farsighted (hyperopic). This means that the eyes must work harder to see clearly, particularly when the object of regard is up close. This focusing effort is called accommodation. The closer an object is to the eye, the greater the amount of accommodation that is required. A side effect of the accommodative effort can be excess convergence or crossing of the eyes.

## WHY IS ACCOMMODATIVE ESOTROPIA A CONCERN IN CHILDREN?

If a child's eyes cross at an early age, then vision will not develop normally. Vision can be permanently reduced in one eye if it is not "used" properly during childhood (this is called [amblyopia](#)), and fine depth perception may never develop. If crossing of the eyes is diagnosed and treated early, then vision development can proceed normally. Crossing of the eyes is never normal (except for occasional crossing in the first three months of life), and any child suspected of having crossed eyes should be examined by a pediatric ophthalmologist.

## DO ALL CHILDREN WITH FARSIGHTEDNESS HAVE ACCOMMODATIVE ESOTROPIA?

No, in fact most children are farsighted but the majority of them do not have any esotropia. Most children are only mildly farsighted, and thus the accommodative effort they make to see clearly is not significant. The more farsighted a person is, however, the greater the amount of effort they must exert and the more likely they are to cross their eyes. Therefore, while two individuals may have the same eye prescription strength, one may have eye crossing and the other may have perfectly straight eyes. Heredity plays a role in determining which children develop [esotropia](#).

## HOW IS ACCOMMODATIVE ESOTROPIA TREATED?

Initial treatment for accommodative esotropia usually involves the prescription of eyeglasses or contact lenses to correct the patient's refractive error (hyperopia) [See figure 1]. By letting the eyeglasses do the

work, the eyes can relax their focusing or accommodative effort. In turn, this will reduce the convergence or crossing stimulus and the eyes will straighten as they relax. Glasses or contacts which are used to treat accommodative esotropia should be worn full time.

### **WHAT HAPPENS AFTER A CHILD STARTS WEARING GLASSES FOR ACCOMMODATIVE ESOTROPIA?**

Even after a child has been successfully wearing glasses to treat accommodative esotropia, it is still normal for the eyes to continue crossing without the glasses. In fact, the crossing may be even more noticeable than it was before the child started wearing glasses. The important thing is whether the eyes are straight and controlled with the glasses on. If the eyes are not straight with glasses on, then vision with two eyes will not develop normally. Your pediatric ophthalmologist is the best person to judge this and will give you feedback at follow-up examinations. These follow-up examinations are important not only to monitor the eye crossing, but also to check for associated problems such as [amblyopia](#) (decreased vision in one or both eyes which is common in this type of strabismus).

### **WHAT ROLE DOES SURGERY PLAY IN ACCOMMODATIVE ESOTROPIA?**

Surgery is indicated only if the eyeglasses fail to straighten the eyes while the glasses are on. In this case, eye muscle surgery ([strabismus surgery](#)) may be recommended to help improve eye alignment. This surgery is usually done in childhood to help promote binocular vision development (ability to use the two eyes together and develop depth perception). Usually surgery for accommodative esotropia does not eliminate the need for glasses, but rather fixes the amount of crossing that is “left-over” when the glasses are on. The eyes will likely continue to cross when the glasses are off.

## Exotropia

Exotropia is a form of [strabismus](#) where the eyes are deviated outward. It is the opposite of [esotropia](#) and usually involves more severe axis deviation than [exophoria](#). People with exotropia often experience crossed [diplopia](#).

Infantile exotropia (sometimes called "congenital exotropia") is seen during the first year of life, and is less common than "essential exotropia" which usually becomes apparent several years later.

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There are two types of exotropia:

- Constant
- Intermittent

### Constant exotropia

This occurs when the eye turn is present all of the time, at all distances. This type of strabismus occurs less frequently than the intermittent type.

Treatment for this condition should be prescribed early in order to recover proper binocular vision. [Vision therapy](#), with or without eyeglasses, eye patching, drops, or [surgery](#) is the most effective approach in treating constant exotropic strabismus.

### [Intermittent exotropia](#)

This the most common form of exotropia, occurs when the eye turn is only present occasionally. In many cases, the eye turn may only be visible during stressful situations or when the person is tired or ill.

### Signs and symptoms

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The earliest sign of exotropia is usually :

- 1- outward deviation of the eye

This sign may at first be intermittent, occurring when a child is daydreaming, not feeling well, or tired. It may also be more noticeable when the child looks at something in the distance.

2-double vision or diplopia.

3- [amblyopia](#), or lazy eye

4-impairing depth perception.

5-Eyestrain

6-Headaches

7- inability to focus while reading

8-Motion sickness

## Causes

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1-one or more of extra ocular muscles does not work properly,

2-disorders that affect the brain such as cerebral palsy, Down syndrome, hydrocephalus, and [brain tumors](#)

3-psychiatric disorder

## Treatment of exotropia

The most successful treatment for strabismus is vision therapy, usually with other means such as eye patching, eyeglasses, and [surgery](#).

Vision therapy treats the underlying cause, improves the eye-brain connection and retrains [visual skills necessary for binocular vision](#).

Surgery should be used when:

1-Reduction in or loss of stereopsis

2-Deteriorating fusion .

3-Large angle of deviation.