

Eye Alignment & Pediatric Ophthalmology

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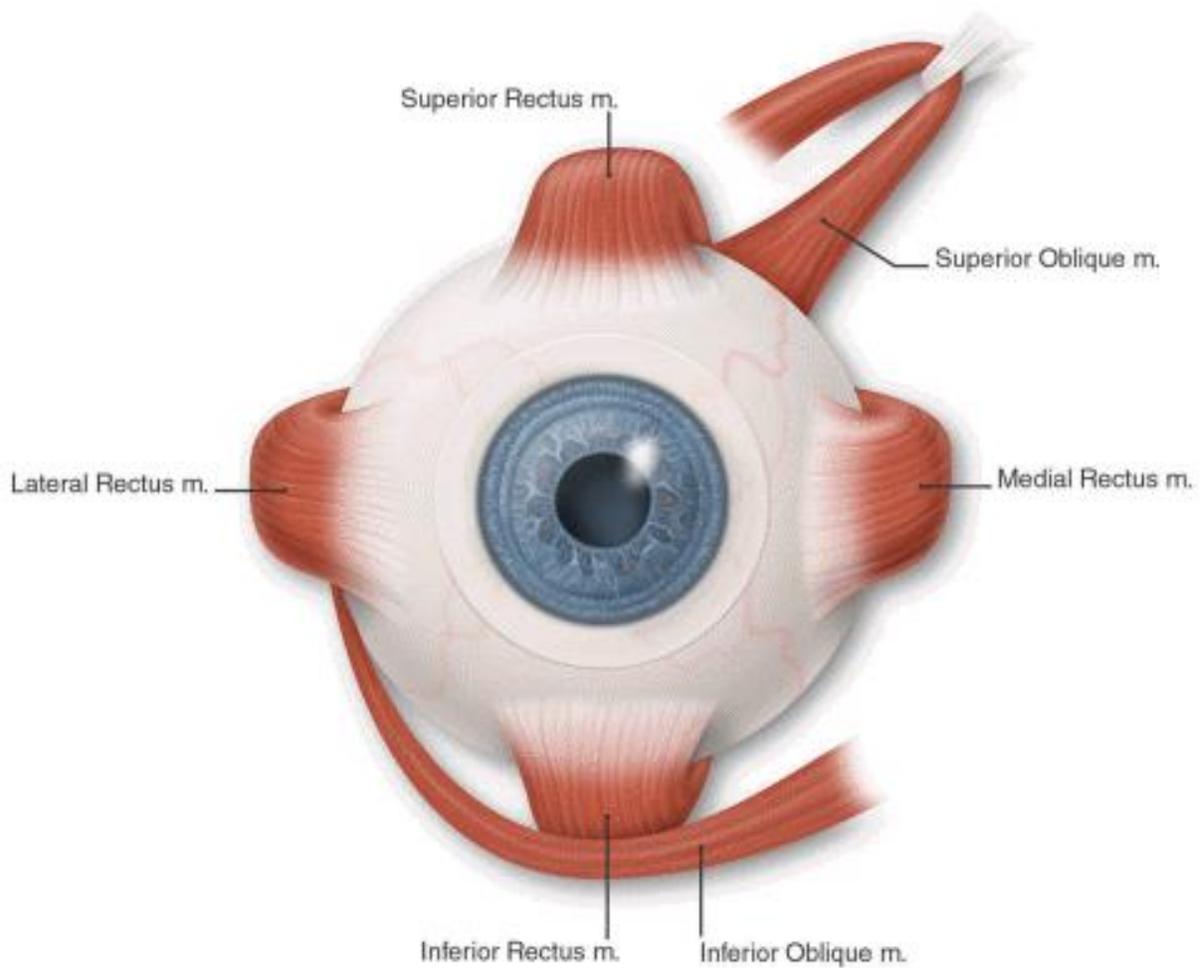


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Strabismus

Strabismus, more commonly known as **cross-eyed** or **wall-eyed**, is a vision condition in which a person can not align both eyes simultaneously under normal conditions. One or both of the eyes may turn in, out, up or down. An eye turn may be constant or intermittent.

Strabismus in children does not go away on its own and strabismus in adults is treatable, so strabismus treatment is necessary regardless of a person's age.

Types of strabismus:

Esotropia -Inward turning of the eyes, also known as “crossed eyes”.



Fig. 1 Large-angle infantile-onset esotropia.

Exotropia - Outward turning of the eyes, also know as “wall eyed”.



Fig. 2 Child with exotropia of the right eye.

Hypertropia - Vertical misalignment in which the abnormal eye is higher than the normal eye.



Hypotropia - Vertical misalignment in which the abnormal eye is lower than the normal eye.



Causes of Strabismus:

- Most commonly, Strabismus occurs when there are neurological or anatomical problems that interfere with the control and function of the extraocular muscles.
- Less commonly, strabismus occurs because of an actual problem with the eye muscles.
- Trauma resulting in brain damage or nerve damage that impairs control of eye movement as well as damage of the eye muscles from trauma to the eye socket.

Treatment of Strabismus:

The goal of strabismus treatment is to improve eye alignment which allow for the eyes to better work together (binocular vision).

Treatment methods:

1. Eye glasses
2. Eye exercises (Orthoptics)
 - a. Eye exercises attempted to strengthen the eye muscles
3. Prism
4. Eye muscle surgery

Pediatric Strabismus

It is estimated that up to 5 percent of all children have some type or degree of strabismus. Children with strabismus may initially have double vision. This occurs because of the misalignment of the two eyes in relation to one another. In an attempt to avoid double vision, the brain will eventually disregard the image of one eye (called suppression).

Sometimes newborns have intermittent crossed eyes due to incomplete vision development, but this frequently disappears as the infant grows and the visual system continues to mature. Most types of strabismus, however, do not disappear as a child grows. Strabismus can be found in all children, however strabismus is more likely in children with disorders that affect the brain such as cerebral palsy, Down syndrome, hydrocephalus, or brain tumors. Genetics also may play a role: If you or your spouse has strabismus, your children have a greater risk of developing strabismus as well.

Routine children's eye exams are the best way to detect strabismus. Generally, the earlier strabismus is detected and treated following a child's eye exam, the more successful the outcome. Without treatment, your child may develop double vision, amblyopia or visual symptoms that could interfere with reading and classroom learning.

Adult Strabismus

Adults who have strabismus can benefit from the same treatment as children. Some adults are treated with prismatic glasses, but most adults with misaligned eyes are able to have successful surgical correction.

Eye alignment surgery is performed on adults for several reasons and is not considered cosmetic surgery and most insurance will cover it. Eye misalignment can cause disabling double vision and surgery can improve both double vision and depth perception. Strabismus affects adults in emotional and social ways and surgically realigning the eyes can give the appearance of normal eyes, providing a better quality of life.

Common risks of strabismus surgery are residual misalignment of the eyes and double vision. Most double vision is temporary; however, persistent double vision is possible. Less common risks are anesthetic complications, infection, bleeding, retinal detachment and decreased vision.

Eyes can be straightened at any age and should be considered as a treatment option if it's likely to improve symptoms and enhance quality of life.

Strabismus / Eye Muscle Surgery

There are a couple of forms of Strabismus surgery and both of them involve the six extraocular muscles that control eye movements.

Recession Procedure - eye surgeon detaches the affected extraocular muscle from the eye and reattaches it (resection) farther back on the eye to weaken the relative strength of the muscle if it is too strong. In contrast, if the muscle is too weak, your surgeon may use a recession procedure to reduce strength of the opposing muscle (antagonist) to achieve more balanced function of the eye muscles.

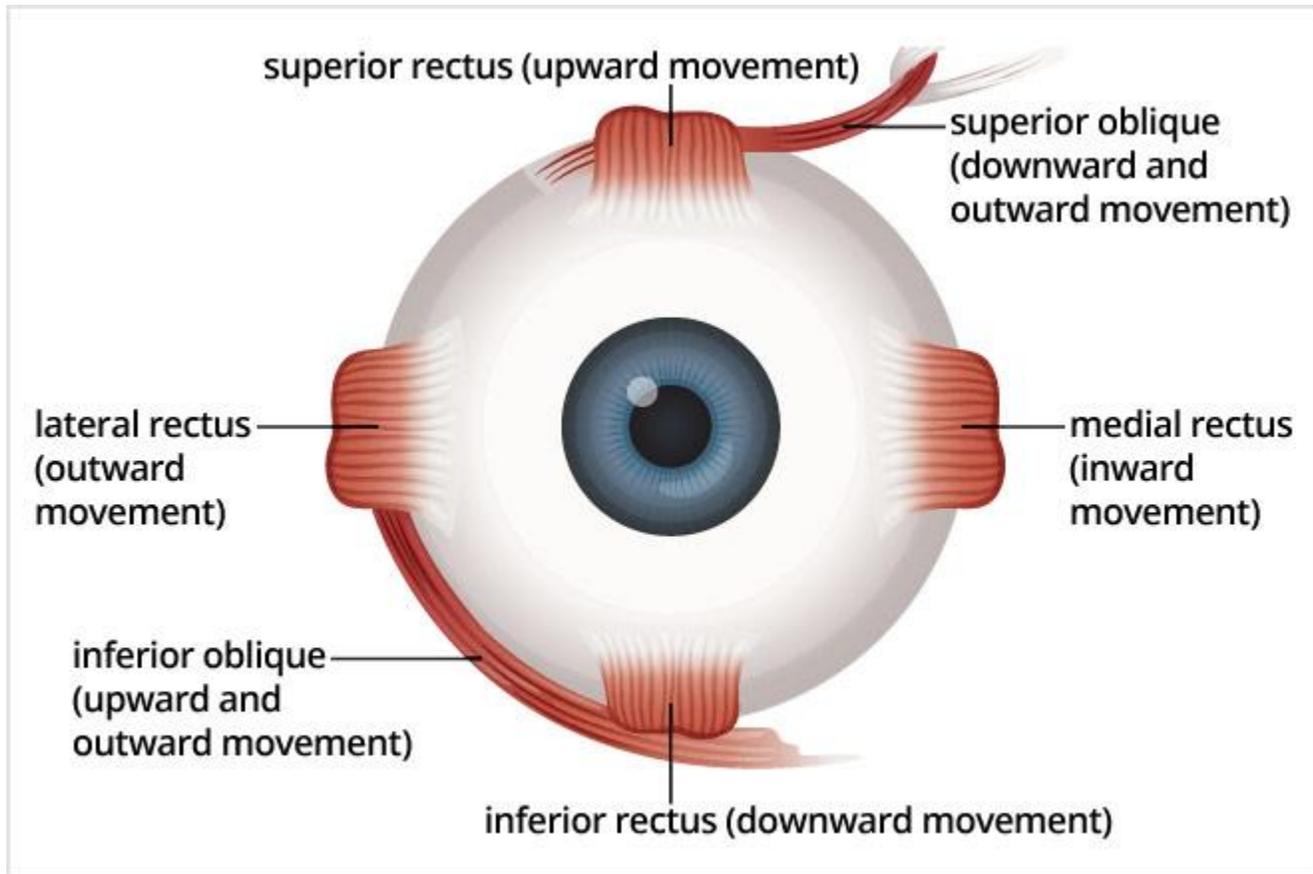
In certain cases, a resection procedure may be used to strengthen an eye muscle to correct misalignment associated with strabismus. If you have esotropia the surgeon may strengthen the lateral rectus muscles — located on the side of each eye, toward the ear — by reattaching the muscle in a different location (resection). In this way, the lateral rectus muscles are relatively strengthened and they can turn the eyes farther outward. This results in better eye alignment.

Adjustable Suture Procedure - surgeon adjusts sutures holding eye muscles in place after a resection procedure, to attempt to improve your final outcome. This surgery is probably best for someone in whom strabismus developed in adulthood after previously normal eye alignment.

In this case, the person is a good candidate because of fusion potential — the ability of both eyes to "lock on" to a target simultaneously, resulting in stereovision and a high degree of depth perception. In most cases, adjustable suture surgery is performed in the operating room, with general or local anesthesia. Afterward the eye is patched. About four to 24 hours later, the patch is removed in the office, when anesthesia and sedation have faded. Ocular alignment is then evaluated.

Based on how your eyes are aligned, your surgeon may decide to use the suture that is in place to tighten or loosen the treated muscle. This adjustment may cause slight discomfort, primarily with muscle tightening. Once the desired alignment is achieved, the surgeon ties the adjustable suture permanently in place, and the procedure is complete.

Extraocular muscles:



Superior Rectus - an extraocular muscle that attaches to the top of the eye. It moves the eye upward.

Inferior Rectus - an extraocular muscle that attaches to the bottom of the eye. It moves the eye downward.

Medial Rectus - an extraocular muscle that attaches to the side of the eye near the nose. It moves the eye inward toward the nose.

Lateral Rectus - an extraocular muscle that attaches to the side of the eye near the temple. It moves the eye outward.

Superior Oblique - an extraocular muscle that comes from the back of the orbit. It travels through the trochlea (a small pulley) in the orbit near the nose and then attaches to the top of the eye. The superior oblique rotates the eye inward around the long axis of the eye (front to back). The superior oblique also moves the eye downward.

Inferior Oblique - an extraocular muscle that arises in the front of the orbit near the nose. It then travels outward and backward in the orbit before attaching to the bottom part of the eyeball. It rotates the eye outward along the long axis of the eye (front to back). The inferior oblique also moves the eye upward.

Other Alignment & Focusing Conditions

Pseudostrabismus - the false appearance of strabismus. Some children's eyes looked crossed because the skin fold at the inner corner of the eyelids can be broad and is often associated with a broad flat nasal bridge (epicanthal folds or epicanthus). These features contribute to a cross eye appearance since there is less space (white area) between the iris and the inner corner of the eyelid. This is especially noticeable in pictures and when the child looks to the side so that one eye appears to be much further into the nose than it should be.

Eye teaming problems- even if eyes appear to be properly aligned, it's possible they do not work together efficiently as a team. Such binocular vision problems can cause headaches, eye strain and other problems that can affect reading and other near vision tasks.

Focusing problems - these problems can range from incompletely developed focusing skills in children to normal age-related declines in focusing ability (presbyopia) among older adults.

Sometimes it is hard to know if a patient has eye alignment or focusing issues. Send your patient for a comprehensive exam to be tested, discuss the findings and offer treatment options best suited to your patient's needs.

Amblyopia

Amblyopia occurs when the eyes are turned or when one eye has a much different prescription than the other. The brain will "shut off" the image from the turned or blurry eye.

There may not be a problem with the eye that is visible. Vision loss occurs because nerve pathways between the brain and the eye aren't properly stimulated. The brain learns to see only blurry images with the amblyopic eye even with eye glasses. This causes the brain to favor one eye due to poor vision in the other eye.

This is sometimes referred to as "lazy eye" and is the leading cause of vision loss in children. Left untreated, amblyopia can stunt the visual development of the affected eye, resulting in permanent vision impairment. Amblyopia is often treated by patching the stronger eye for periods of time.



Blurred View

Normal View

Fig. 1 Amblyopia occurs when one eye experiences a blurred view and the other a normal view, but the brain only processes the normal view

There are three main types of Amblyopia:

Strabismic Amblyopia -This type develops when the eyes are not straight. One eye may turn in, out, up or down. This causes the brain to begin ignoring or “turns off” the eye that is not straight and vision drops in that eye.

Deprivation Amblyopia - This type occurs if cataracts or similar conditions deprive young eyes of visual experience. If not treated very early, these kids never learn to see very well and have very poor vision. This can affect both eyes.

Refractive Amblyopia -This type happens when there is a large or unequal amount of refractive error between a child’s eyes. The brain learns how to see well from the eye that has less need for glasses and does not learn to see well from the eye that has a greater need for corrective lenses.

Treatment for Amblyopia:

- Consistent use of eye glasses or contact lenses.
- Enable as clear an image as possible. (Ex. Remove cataract)
- Forcing use of weaker eye (patching or eye drops to blur the stronger eye)

Vision Screening for Amblyopia:

The American Academy of Pediatrics strongly recommends vision screening over the course of childhood to detect amblyopia early enough to allow successful treatment.

Newborns: Check for red reflex to find congenital cataracts.

Infants: Check for ability to fix and follow and if they have strabismus.

Toddlers: Check pupillary red reflexes with a direct ophthalmoscope. (Bruckner Test) or using instruments that can identify a significant refractive error.

Vision Screening Recommendations

Age	Tests	Referral Criteria Comments
Newborn to 12 months	<ul style="list-style-type: none"> • Ocular history • Vision assessment • External inspection of the eyes and lids • Ocular motility assessment • Pupil examination • Red reflex examination 	<ul style="list-style-type: none"> • Refer infants who do not track well after 3 months of age. • Refer infants with an abnormal red reflex or history of retinoblastoma in a parent or sibling.
12 to 36 months	<ul style="list-style-type: none"> • Ocular history • Vision assessment • External inspection of the eyes and lids • Ocular motility assessment • Pupil examination • Red reflex examination • Visual acuity testing • Objective screening device “photoscreening” • Ophthalmoscopy 	<ul style="list-style-type: none"> • Refer infants with strabismus • Refer infants with chronic tearing or discharge. • Refer children who fail photoscreening.
36 months to 5 years	<ul style="list-style-type: none"> • Ocular History • Vision assessment • External inspection of the eyes and lids • Ocular motility assessment • Pupil examination • Red reflex examination • Visual acuity testing (preferred) or photoscreening • Ophthalmoscopy 	<p>Visual acuity thresholds</p> <ul style="list-style-type: none"> • Ages 36-47 months: Must correctly identify the majority of the optotypes on the 20/50 line to pass. • Ages 48-59 months: Must correctly identify the majority of the optotypes on the 20/40 line to pass. • Refer children who fail photoscreening.
5 years and older* *Repeat screening every 1-2 years after age 5.	<ul style="list-style-type: none"> • Ocular history • Vision assessment • External inspection of the eyes and lids • Ocular motility assessment • Pupil examination • Red reflex examination • Visual acuity testing • Ophthalmoscopy 	<ul style="list-style-type: none"> • Refer children who cannot read at least 20/32 with either eye. Must be able to identify the majority of the optotypes on the 20/32 line. • Refer children not reading at grade level.

Learning Disabilities

Learning disabilities are neurologically-based processing problems. These processing problems can interfere with learning basic skills such as reading, writing and/or math. They can also interfere with higher level skills such as organization, time planning, abstract reasoning, long or short term memory and attention. It is important to realize that learning disabilities can affect an individual's life beyond academics and can impact relationships with family, friends and in the workplace.

There are numerous types of learning disabilities but Dyslexia is the most prevalent. In fact, approximately 80% of people with learning disabilities have dyslexia.

Dyslexia - a learning disorder characterized by difficulty reading due to problems identifying speech sounds and learning how they relate to letters and words. Also called specific reading disability, dyslexia is a common learning disability in children.

Dyslexia occurs in children with normal vision and intelligence. Many scientific studies have demonstrated that ocular coordination, motility, and visual processing are normal in children with dyslexia.

There's no cure for dyslexia. Sometimes dyslexia goes undiagnosed for years and isn't recognized until adulthood. It's a lifelong condition caused by inherited traits that affect how your brain works. However, most children with dyslexia can succeed in school with tutoring or a specialized education program. Emotional support also plays an important role.

Vision Therapy - an attempt to develop or improve visual skills and abilities; improve visual comfort, ease, and efficiency; and change visual processing or interpretation of visual information. An optometric vision therapy program consists of supervised in-office and at home reinforcement exercises performed over weeks to months. In addition to exercises, lenses ("training glasses"), prisms, filters, patches, electronic targets, or balance boards may be used. There are three main categories of vision therapy:

1. Orthoptic vision therapy – eye exercises to improve binocular function. This is also called Orthoptic Eye Exercises. When pediatric ophthalmologists and orthoptists prescribe orthoptic eye exercises the exercises are taught in the office and carried out at home.
2. Behavioral/perceptual vision therapy – eye exercises to improve visual processing and visual perception
3. Vision therapy for prevention or correction of myopia

Behavioral vision therapy is considered to be scientifically unproven. There is no evidence that vision therapy delays the progression or leads to correction of myopia and scientific literature shows no experimental evidence of any benefits from low-plus "training glasses". Orthoptic eye exercises can be beneficial in the treatment of symptomatic convergence insufficiency but not in the treatment of dyslexia or other learning disabilities. These exercises can easily be taught in the ophthalmology office and carried out in the comfort of your home.

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