

Hypertropia

Hypertropia is a type of strabismus characterized by vertical misalignment of the eyes. Among the many causes of vertical strabismus, one of the most common is a fourth nerve palsy (also known as a superior oblique palsy). Other common etiologies include thyroid-related eye disease, orbital trauma, Brown syndrome, and a third cranial nerve palsy. Hypertropia may also occur following cataract, glaucoma, retinal, or strabismus surgery, even after successful strabismus surgery for horizontal eye misalignment. Adults with acquired eye deviation tolerate less vertical eye misalignment than horizontal eye misalignment. These patients can usually only fuse (see single) with up to two degrees of vertical eye misalignment.

Fourth Nerve Palsy (a.k.a. Superior Oblique Palsy)

Beginning in the brainstem and travelling to different areas of the head and neck are 12 cranial nerves, each of which has a specific function. A fourth nerve palsy refers to a weakness of the nerve that supplies impulses to the superior oblique muscle, a muscle on the top of the eye whose main function is to move the eye downward and whose secondary function is to rotate the eye inward. If this muscle is weak, the eye tends to drift upward (hypertropia) and sometimes rotate outward (a type of cyclotropia).

A fourth nerve palsy is often congenital and diagnosed in infancy. On the other hand, signs and symptoms of a congenital fourth nerve palsy may not appear until later in childhood or in adulthood. In addition, older children and adults can acquire this form of vertical strabismus, for example, with trauma. In acquired cases, it may take four to six months to improve or resolve, if at all. Most patients with an isolated fourth nerve palsy have no known underlying cause.

Signs of a Fourth Nerve Palsy

Adults with a fourth nerve palsy are frequently bothered by double vision. In acquired cases, patients may complain of apparent tilting of objects. In children and adults, a noticeable vertical deviation of the eyes is not always the initial sign. Rather, an individual with a fourth nerve palsy often manifests a head tilt (torticollis) to the side opposite the palsied eye to compensate for the strabismus and to minimize the vertical eye misalignment. The head tilt permits the affected child or adult to experience binocular vision and depth perception.



Patient with a Left Fourth Nerve (Superior Oblique) Palsy and Associated Right Head Tilt Before and After Strabismus Surgery

The two pictures on the left were taken prior to strabismus surgery and the two pictures on the right show the patient after strabismus surgery.



Right Fourth Nerve (Superior Oblique) Palsy and Right Inferior Oblique Overaction

The right eye is higher than the left which worsens when the patient gazes left. When the patient looks up and to the left, the right eye becomes even higher than the left.

Treatment

Prisms in the form of a plastic film that adheres to glasses (Fresnel prism) or correction that is ground into glasses may alleviate symptoms of diplopia or tired eyes (asthenopia) in adult patients with a small eye deviation. Eyeglass prisms bend light and shift the image up, down, left, or right depending on how it is positioned in or on the glasses. They allow the patient's misaligned eyes to work together. They are usually prescribed for small degrees of ocular misalignment since the stronger they are, the more they degrade images and the thicker and heavier they make glasses if ground in. Some patients are intolerant of prisms, even if they are of small power. Moreover, prisms do not help align images if they are rotated.

In cases of fourth nerve palsies, prisms are often poorly tolerated because 1) the amount of prism necessary to address the magnitude of eye misalignment often makes images blurry, 2) prisms do not change power when patients look in different directions (vertical eye misalignment is worse when patients gaze to the opposite direction and tilt their head to the same side as the eye with the fourth nerve palsy) and 3) prisms do not eliminate tilting of objects. In addition, prisms are usually avoided as treatment for children because image degradation is undesirable for their developing visual system. Surgery is tailored to align eyes and promote stereoacuity in different gaze positions. Therefore, eye muscle surgery is generally recommended as the treatment for fourth nerve palsy in adults and children. Following a corrective eye muscle procedure, the associated abnormal head tilt usually decreases or disappears.

Since infants with a congenital fourth nerve palsy (or any other type of strabismus) may favor one eye and habitually ignore the other deviated eye, they may develop amblyopia (lazy eye) or poor vision in one eye due to inadequate visual stimulation. If present, amblyopia should be addressed before proceeding with strabismus surgery in children.

Frequently Asked Questions

Do children outgrow a fourth nerve palsy? No.

Will eye exercises help this problem? No.

At what age should the surgery be performed?

Most pediatric ophthalmologists recommend surgical correction of a congenital fourth nerve palsy sometime after age six months. Some children and adults require more than one strabismus operation to eliminate the eye misalignment.

Third Nerve Palsy

A third nerve palsy refers to a weakness of the cranial nerve that supplies impulses to four of the six extraocular muscles, to a muscle that elevates the eyelids, and to the pupil. This may be congenital or acquired following head trauma, brain tumor, stroke, or cerebral aneurysm. The affected eye is generally turned outward (exotropia) and downward (hypotropia). At times, there is an associated droopy eyelid (ptosis) or enlarged pupil.

Occasionally a congenital or acquired third nerve palsy can “regenerate” spontaneously over the course of six months. While we wait to see if the third nerve palsy resolves without intervention, the patient may occlude one glasses lens or cover one eye to help alleviate diplopia. If the strabismus arising from a third nerve palsy remains stable but significant, eye muscle surgery can be performed to eliminate ocular misalignment and restore single vision, at least in primary gaze. A droopy upper lid can confound the

patient's ability to use the realigned eye. In that case, ptosis repair following strabismus surgery becomes warranted.

Thyroid Eye Disease

Thyroid eye disease represents the most common cause of vertical eye deviation in adults. Extraocular muscles (without involvement of the associated tendons) enlarge with fluid and lymphocytic infiltration, become inflamed, and then fibrotic. The extraocular muscles are affected in the following order: Inferior, medial, superior, and lastly, the lateral rectus muscles. These changes cause the affected muscles to become asymmetrically or unequally tight, which leads to restricted eye movements, lid retraction, and prominent-appearing eyes. Sometimes patients benefit from orbital, eye muscle, and lid surgery, in that order. These changes can occur even with normal thyroid bloodwork.

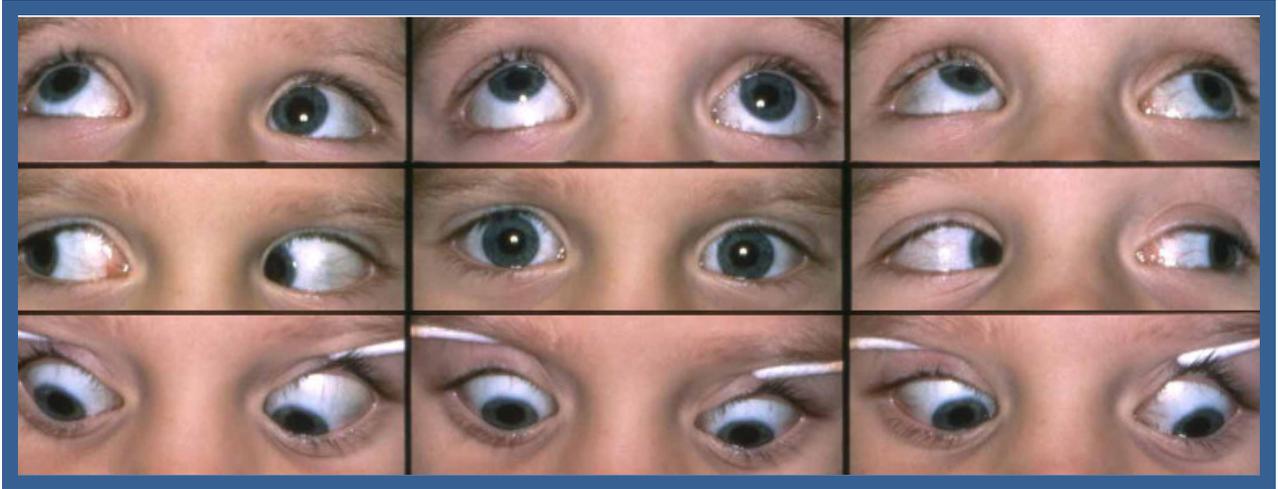


Thyroid Eye Disease with Lid Retraction and Prominent-Appearing Eyes

Brown Syndrome

Brown syndrome is a condition typically present at birth but sometimes acquired later in life in which the affected eye is unable to move upward, especially when it is turned in toward the nose. This is caused by the inability of the superior oblique muscle, one of the muscles on the top of the eye, to slide through its natural pulley along the nasal bony wall of the eye socket. This condition is often first noted when a parent sees upward floating of the uninvolved eye as the child looks to the side opposite the affected eye. Alternately, patients may exhibit a Y pattern eye misalignment, i.e. exotropia or outward turning of the eyes in upgaze.

Brown syndrome is sometimes an incidental finding on an eye examination and does not necessitate treatment. However, if the involved eye is lower than the other eye when the individual is looking straight ahead or a chin up position is needed to keep the eyes aligned, eye muscle surgery should be considered.



Brown Syndrome of the Left Eye

Limitation of the left eye to look upward, especially when it is turned toward the nose. Mild outward turning of the eyes when the patient looks straight up. Mild depression of the left eye when the patient looks to the right.