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8 Esotropia: Eyes That Turn In

Esotropia, commonly called "crossed eyes," is the most frequently encountered form of strabismus. There are three broad categories of esotropia: congenital (also called infantile), accommodative, and sensory. Sensory esotropia was discussed briefly in Chapter 6 ("Poor vision as a cause of strabismus"). The other two, which are far more common, will be the focus of this chapter.

Congenital esotropia

In spite of its name, congenital esotropia rarely starts at birth; it is generally first noted at several months of age. Thus it is sometimes called *infantile esotropia*, which is actually a more accurate term. This form occurs frequently in children who have cerebral palsy, hydrocephalus, or developmental delay, and is less common (about 1 in 100) among otherwise normal infants. Usually there is no family history, but it is more likely if other family members have the same condition. Infantile esotropia is idiopathic.

In nearly all cases, the angle of crossing is fairly large so that the deviation is easily seen, at least by 6 months of age when the infant is sitting well and looking at the world. About half of these infants

CONGENITAL ESOTROPIA. Typically beginning during the first 6 months of life, this large deviation is probably better termed infantile esotropia. Note the displacement of the corneal light reflex in the left eye, indicating approximately a 20 degree esotropia by the Hirshberg method.

fixate alternately with each eye, so both eyes learn to see well. In the other half, one eye is preferred for looking and the eye that is not used becomes amblyopic ("lazy").

Treatment: Treatment begins with covering the good eye with a patch in order to force the use of the weak eye and strengthen its vision. After vision in the two eyes has been equalized, the esotropia nearly always remains, and surgery is needed to correct it.

Nearly always, the esotropia remains after the vision is equalized by patching, and surgery is needed to correct it.

It is generally felt that it is better to move each eye half the distance needed to correct the deviation than to operate on just one eye. Most ophthalmologists, at least in North America, prefer to do the surgery when the child is between the ages of 6 and 18 months, when there may still be time for the development of some binocularity. In most cases the eyes straighten immediately after surgery and the child begins to use both eyes together. Many parents report a jump in performance soon afterward, with the child acquiring some new skill or reaching some new milestone in development.

About half of these children will have eyes that remain essentially straight indefinitely. They learn to use their eyes together, though not quite as well as those who have never had strabismus. They do not acquire the high degree of stereopsis needed to pass the test to become fighter pilots, for example, but in other respects their eyes are normal for the rest of their lives.

In the other half of these children, the eyes do not remain aligned. Strabismus of some sort appears again, usually showing up months to years later. The esotropia may recur (often as accommodative esotropia, which can be controlled with glasses; if not, more surgery may be required). Less often, exotropia develops and may also require more surgery, perhaps years later.

Sometimes, either before or after surgery, one or both eyes begin to turn upward. This *hypertropia* is most likely to start when the child is between 1 and 4 years of age. There are several types, which will be discussed in Chapter 10.

Pseudoesotropia in infants. Parents and grandparents may initially expect the crossing to disappear on its own. This is a misconception that arises because many infants appear to have crossed eyes when in fact they do not; this *pseudoesotropia* does disappear as the infant gets older. True esotropia, unfortunately, does not disappear.

Nearly all infants appear to have crossed eyes *(see photo at right).* Older children and adults have an equal amount of white space (the sclera) on each side of the colored iris. But in infants, the sclera is partly hidden by their flat, wide nasal bridges. Eventually, the head gets larger, the eyes move farther apart and the bridge of the nose becomes more prominent, in effect pulling together the skin between the eyes and exposing more of the sclera.

PSEUDOESOTROPIA. Because this photograph shows the child looking slightly to his left, the right eye looks turned in. However, the corneal light reflex from the flash camera is centered in each pupil, indicating normal alignment.

Accommodative esotropia

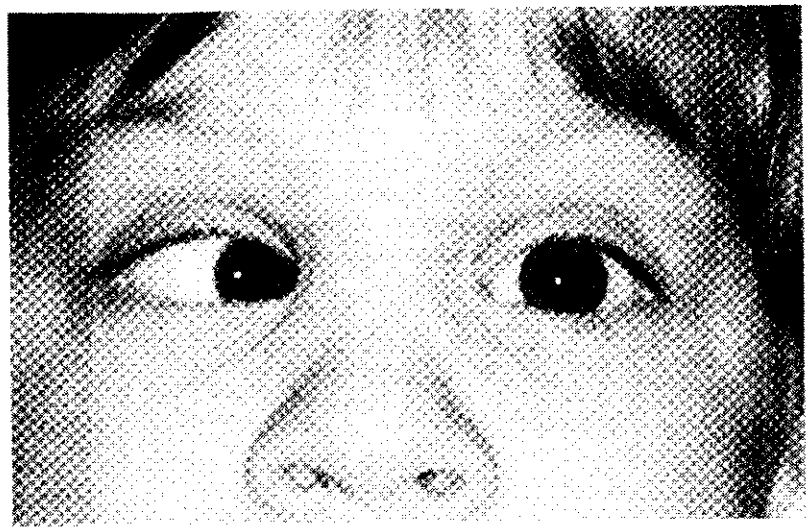
The most common esotropia is the type called "accommodative," which is intimately related to hyperopia (farsightedness). Accommodative esotropia typically starts at about the age of 2, but the child may be as young as 6 months or as old as 5 years. The deviation may be intermittent at first, but it usually becomes constant soon afterward. Many children begin to prefer one eye, so amblyopia is likely to develop in the deviating eye. If the esotropia begins during an illness or after a fall, the parents may think it was caused by the illness or injury; however, the two occurrences are really just a coincidence.

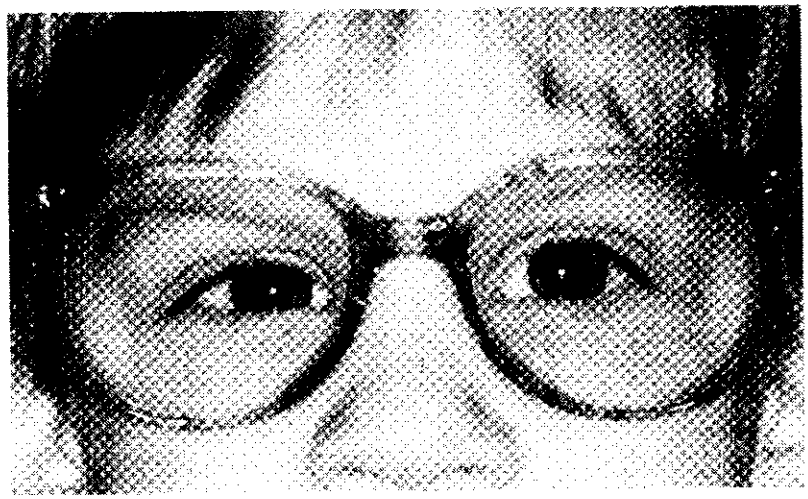
Up to about age 40, the normal eye has the remarkable ability of *accommodation*, which provides focusing power to bring the focal point forward toward the retina to obtain clearer vision. When people with normal eyes look at something near, each eye accommodates to see the near object. Farsighted (hyperopic) people must use exactly the same process to clear their vision for distant objects—and even more for near ones.

If the amount of hyperopia is large enough, the amount of accommodation needed to see clearly will cause so much convergence that one eye will turn in.

Whenever the eyes accommodate, whether to look at something near or to clear the distance vision in hyperopia, the eyes have a tendency to converge, or turn in. If the degree of the hyperopia is large enough, the amount of accommodation needed to see clearly—even at a distance—will cause so much convergence that one eye will turn in.

Moderately farsighted children, in order to see clearly at a distance, must accommodate and converge as much as people with normal eyes do when they are looking at something near. In doing so, they become esotropic. If they wear glasses to correct the farsightedness, the lenses do the focusing and there is no need for the eyes





ACCOMMODATIVE ESOTROPIA. Top: the right eye of this farsighted child turns in when he looks with the left eye without glasses. Bottom: with glasses on, the child's eyes are straight. The pupils have been dilated for examination. (Photos courtesy Ken Wright, M.D.)

to accommodate or to converge. Happily, the eyes are straight, but only as long as the glasses are worn. (Some farsighted children are fortunate to have an unusual capacity to control their alignment when accommodating, and as a result manage to avoid esotropia.)

Most children are at least slightly farsighted for their first 6 years or so. But in about 98% of them the hyperopia is so mild that the little accommodation needed to see clearly does not cause excessive convergence. The eyes remain straight, with no esotropia. In the other 2% the hyperopia is strong enough to cause too much convergence when the child accommodates to see clearly, and esotropia results. Accommodative esotropia often runs in families. But it isn't inherited; it's the hyperopia that is inherited.

Treatment: The first step is to determine the degree of hyperopia (along with any astigmatism) that is present and to prescribe cor-

rective glasses. If the child has amblyopia, treatment for that condition may be started at this time, or it may be started at a later visit.

As soon as the child begins to wear the glasses, the esotropia decreases, with the full effect taking place within about a month. For most children with accommodative esotropia, glasses eliminate the esotropia completely, or nearly so, and no surgery is needed. If a noticeable esotropia remains even when the child is wearing the proper glasses, the ophthalmologist and the parents may decide to correct the remaining esotropia with eye muscle surgery.

For most children with accommodative esotropia, glasses eliminate the esotropia completely, or nearly so, and no surgery is needed.

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The child will need to wear glasses as long as the hyperopia is great enough to cause esotropia when they aren't worn. Most children with accommodative esotropia will probably wear glasses or contact lenses as long as they live. They do so willingly; they see more comfortably when the glasses relieve the need to accommodate and they may appreciate the restoration of binocularity.

The hyperopia will likely increase until about the first grade, then decrease a bit over the next decade. In a few children the hyperopia just gradually goes away; by the time they are teenagers these lucky few no longer need glasses.

Esotropia at near Because it's normal to accommodate when looking at something up close, it's not surprising that accommodative esotropia is sometimes worse at near. In fact, about half of all children with accommodative esotropia have an increased angle of crossing when they read.

A few children may actually have eyes that are straight when they are looking at a distance and cross only when they are looking at something close. In these cases, the problem may be difficult to see, since the crossing may be hidden by what the child is looking at—a book, for example. The deviation is typically noticed at mealtime. When the child's head is up and the eyes are fully visible, the family can see the eye turning inward.

Treatment: If the added crossing for near vision is mild, it may require no added treatment. Children who are mildly farsighted and whose eyes are straight for distance vision and cross only slightly at near may simply be observed. Children who are very farsighted may get enough relief from their regular glasses even when lookingup close.

Bifocal lenses are the classic treatment for the added crossing at near. Just like the bifocals prescribed for presbyopia, these have added focusing power in the lower segments of the lenses. The upper segments contain the regular distance prescription.

It's surprising how easily children adapt to bifocals; indeed, they seem to take to them much better than adults do! Of course, if they happen to look at something up close through the upper segments of the lenses, the crossing may momentarily reappear. And they occasionally complain of double vision from the line between the lens

segments (which should ideally be positioned even with their pupils). But such problems are remarkably minor. As the children get older, the added crossing at near may gradually decrease and the strength of the bifocals can be decreased as well. In some cases, they can eventually be discontinued altogether.

Partially accommodative esotropia Some children with accommodative esotropia achieve only partial control of their crossing when they wear their farsighted correction (even with bifocals). The esotropia is much less when the glasses are worn, but some crossing remains.

The problem can occur in several different ways.

- A 2-year-old begins to cross an eye, is found to be farsighted, and is given the correct glasses. But even with glasses the child's eyes still cross badly enough that surgery is required. This was the case with little Heather, whose story we have been following (Introduction, Chapter 6). Some specialists believe this sequence is more likely if treatment is delayed beyond a few weeks or months after the crossing begins.
- An esotropia that initially responds to glasses can later "deteriorate" so that glasses no longer completely straighten the eyes. It isn't known why this change occurs, but fortunately it doesn't happen very often. Surgery is usually successful.
- A child requires surgery for esotropia either because glasses aren't needed or because they simply don't make the eyes straight. After the eyes have been successfully aligned by surgery, the esotropia may recur, usually to a much smaller degree. This time the glasses can control the esotropia. Actually, this type of partially accommodative esotropia occurs fairly often.

More about treatment

It's easy to see that esotropia and its treatment can be confusing, especially when children have a combination of several different types. Some children may begin with glasses, progress to bifocals, then eventually need surgery anyway. One question some parents ask is, "If surgery is needed to correct the crossing that remains since my child has started to wear glasses, why not move the muscles a bit more and eliminate all of the crossing with surgery? Wouldn't my child then have straight eyes without glasses?"

That is a logical question. In a few cases surgery can make glasses unnecessary, especially if the correction needed is very weak. *But it is important to remember that it is the accommodation needed for clear vision that causes the convergence and hence the esotropia.* Children

with accommodative esotropia are farsighted. And that farsightedness is a refractive error of the eyes, not a problem in the eye muscles that can be corrected with surgery. Relying on surgery to do what should be done with glasses may risk an *outward* deviation of the eyes.

Some eye doctors occasionally recommend treating accommodative esotropia with eyedrops or ointments *(miotics)* instead of glasses. In part, the medication works by inducing accommodation locally, so the reflex that includes convergence and accommodation is not activated. The medications may not work as well as glasses, and they can have side effects (especially pupillary cysts) that limit their long-term usefulness. But they can be helpful, for example, during the summer months when glasses would interfere with swimming.

Although more than one type of treatment may be required and periodic follow-up is important, children with all forms of esotropia have an excellent chance of growing up with good vision and straight eyes. In many cases, they have useful binocular vision and may even have normal stereopsis.