

Esotropia

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Short Communication

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Short Communication

Strabismus is misalignment of the eyes such that both eyes are not simultaneously directed at the same object. Esotropia is a type of strabismus characterized by an inward deviation of one eye relative to the other eye. It may be concomitant or incomitant. In a concomitant esotropia the variability of the angle of deviation is within 5 Pd in different gaze positions. In an incomitant deviation the angle of deviation differs in various gaze positions.

Classification:

1. Accommodative

a. Refractive

- Fully accommodative
 - Partially accommodative
- ###### b. Non refractive
- With convergence excess
 - With accommodation weakness

c. Mixed accommodative

2. Non-Accommodative

- Essential infantile
- Microtropia
- Basic
- Convergence excess
- Convergence spasm
- Divergence spasm
- Divergence insufficiency
- Divergence paralysis
- Sensory
- Consecutive
- Acute onset
- Cyclic

Accommodative Esotropia

Pathophysiology: A patient with uncorrected hyperopia must accommodate to clear a blurred retinal image. This process of accommodation will stimulate convergence and strain fusional divergence. When fusional divergence is overcome, the eyes cross. The patient with uncorrected hyperopia can see either a single blurred image or a double image in which one image is clear and one image is blurred. Over time, the blurred image can be suppressed; fixation can alternate; or, more commonly, amblyopia can occur.

Refractive Accommodative Esotropia

Refractive accommodative esotropia is an esodeviation in uncorrected hyperopia with normal AC/A ratio. The considerable amount of accommodation required to focus clearly even on distant target is accompanied by a proportionate amount of convergence, which is beyond the patient's fusional divergence amplitude. It therefore manifests in convergent squint.

- Magnitude of deviation varies very little (< 10 pd) between distance and near.
- Avg age of presentation – 2.5 years (6 months to 7 years)

It's of 2 types:

Fully Accommodative: Esodeviation is completely eliminated by optical correction of hypermetropia.

Treatment: full cycloplegic correction.

Partially Accommodative: Esodeviation is reduced but not completely eliminated by optical correction of hypermetropia.

Treatment: full cycloplegic correction + surgery for residual amount of esotropia.

Non Refractive Accommodative Esotropia

Key feature is **High AC/A ratio**: (Accommodative convergence to accommodation). The deviation is greater at near than at distance.

1. Convergence excess

- High AC / A ratio is due to increased AC
- Normal near point of accommodation

2. Hypoaccommodative (with defective accommodation)

- High AC / A ratio is due to decreased A (weak accommodation leading to strong convergence response)
- Remote near point of accommodation
- Extra accommodative effort is required for near resulting in convergence excess.

Treatment is full cycloplegic correction +/- bifocals.

Mixed Accommodative Esotropia

High hypermetropia and high AC/ A ratio may co exist, resulting in exotropia for distance which increases markedly on (> 10 pd) on near fixation. In this type also patient requires bifocal glasses to correct the deviation for distance as well as near.

Work Up of the Patient

Carefully examine visual acuity in a manner appropriate for the patient's age.

- For patients younger than 1 year, visual acuity is measured by objective means.
- For patients aged 1-3 years, subjective methods, such as Allen cards, are used in addition to objective methods.
- For patients aged 3-5 years, subjective methods, such as Allen cards, tumbling Es, or the letter chart, can be used.
- For patients older than 5 years, the Snellen alphabet chart almost always can be used. The patient usually will have hyperopia in the range of +3.00 to +10.00 diopters.
- Determine stereo acuity using polarized glasses and Titmus test or Randot stereogram.
- Check extraocular movements to ensure that the eye movements are full.
- Measure or estimate the angle of deviation.

- The easiest method is to evaluate the centration of the corneal light reflex in each eye with prism bar, while the patient fixes on objects at distance or near.
- In some cases, it is possible to perform the alternate cover test. Ask the patient to fix on an object. By alternately covering and uncovering each eye, the examiner can detect a shift in the eye's position with refixation. In esotropia, as an eye is uncovered, it turns out to fixate. In true accommodative esotropia, the angle of deviation is the same when measured at distance and near fixation and usually is 20-40 prism diopters.
- Measure AC/A.
- If this ratio is high, then the deviation measured at near will be significantly greater than that at distance.
- In pure accommodative esotropia, the AC/A ratio should be normal; distance and near measurements should be the same.
- Perform complete eye exam.
- Examine the anterior segment to assess the cornea, anterior chamber, and lens.
- Examine the fundus with both direct and indirect ophthalmoscopes.
- Note the appearance of the macula and the optic nerve.
- Perform cycloplegic refraction (under atropine) on all children by using the retinoscope and loose lenses.

Medical Care

- Prescription of the full amount of hyperopic correction provides adequate treatment for refractive (accommodative) esotropia in 75% of cases.
- Anticholinesterase drops or ointments in patients with a normal AC/A ratio are not as effective as glasses.
- In cases of amblyopia, early treatment by patching the normal eye is the mainstay of treatment.

Surgical Care

- Surgery may be required if the esodeviation becomes refractory to optical treatment. Surgery often is needed when treatment is delayed.¹⁴
- Surgical treatment typically entails recession or weakening of the inward-pulling medial rectus muscle in each eye. In cases involving amblyopia, surgery can be limited to only the amblyopic eye by performing a recession of the medial rectus and a resection or strengthening of the lateral rectus.
- Surgery is performed for the nonaccommodative component only. The operation is not intended to discontinue use of glasses.

Follow up

- Patients who are treated for amblyopia should be seen at 1- to 4-month intervals depending on their age.
- Stable patients are typically seen every 6 months.
- Cycloplegic refraction is repeated at least annually and any time esotropia worsens.

Infantile Esotropia

Natural History

Studies indicate that infantile esotropia is not congenital and most likely develops between 2 and 4 months of age, a period during which most infants are becoming orthotropic. A history of infantile esotropia in parents or siblings of affected patients is common. Usually characterized by a large and constant deviation, infantile esotropia can be associated with cross-fixation (viewing targets in the right field of gaze with the left eye and vice versa), severely interfering with the development of normal binocular vision. It must be distinguished from pseudoesotropia and other early-onset esotropias, including Duane syndrome, congenital abducens nerve or lateral rectus palsy, Moebius' syndrome, and sensory and accommodative esotropias.

- Etiology: faulty innervational control involving the supranuclear pathways for convergence and divergence and their neural connections to the medial longitudinal fasciculus.

Hereditary: Autosomal Dominant

Key features

Patients with infantile esotropia may exhibit any of the following:

- A large-angle, usually constant, esotropia (generally 40–60 PD) at distance and near that begins before 6 months of age
- Comitant.
- Refractive errors skewed toward low to moderate hyperopia (approximately 50 percent have hyperopia exceeding 2 D)
- Amblyopia (about 40 percent of all cases)
- A high occurrence of various ocular motility disorders, including overelevation in adduction (inferior oblique overaction), and dissociated vertical deviation, dissociated horizontal deviation.
- Limited potential for both normal binocular vision and high levels of stereopsis
- Latent or manifest nystagmus

- Monocular nasotemporal-pursuit optokinetic nystagmus (OKN) asymmetry.
- **Alternate fixation:** occurs if at various times either eye is used for fixation a vision will be nearly equal in both eyes
- **Cross fixation:** occurs with large angle esotropia when the right eye is used for left gaze and the left eye is used for right gaze

Early Detection and Prevention

Transient strabismic deviations, which are mostly exotropia, occur frequently in neonates, but in most cases have been reported to resolve *20 Strabismus: Esotropia and Exotropia* by 3–4 months of age. 81,82 Instability of ocular alignment also occurs in infantile esotropia. More than 25 percent of patients with esotropia at 2–4 months of age experience spontaneous resolution and become orthophoric, usually by the age of 6 months.⁸⁶ The resolution of the esotropia is more likely with intermittent, small-angle, variable esotropia and less likely in infants with constant esotropia exceeding 40 PD.^{86,87} Any infant with intermittent, small-angle, variable esotropia that persists beyond 6 months of age should be examined immediately. Because strabismus may be secondary to a more serious condition, early examination should be encouraged, especially in the presence of any additional ocular findings (e.g., leukocoria).

Treatment

- Correction of hyperopia
- Treatment of amblyopia
- Surgical treatment: Bimedial rectus recessions or medial rectus recession and lateral rectus resection.

Paretic (Noncomitant) Esotropia: (Sixth nerve Palsy)

- More common in adults
- Differential Diagnosis:
 1. Microvascular diseases: Diabetes and Hypertension
 2. Inflammatory and infectious CNS disorders: meningitis, raised ICP
 3. CNS tumors
 4. Head trauma
- ET is greater at distance than at near.
- Treatment: Wait till 6-8 weeks: Botulinum toxin.
- > 6 months: medial rectus recession + lateral rectus resection.

Pseudoesotropia

- Occurs in patients with flat broad nasal bridge and prominent epicanthal folds.
 - Gradually disappears with age.
- Hirschberg test differentiates it from true esotropia.

Secondary Esotropia

An esotropia that results from a primary sensory deficit or as a result of surgical intervention is classified as a secondary esotropia.

Sensory Esotropia

A convergent strabismus resulting from visual deprivation or trauma in one eye that limits sensory fusion is classified as a sensory esotropia. It may result from any number of conditions that limit visual acuity in one eye (e.g., uncorrected anisometropia, unilateral cataract, corneal opacity, optic atrophy, macular disease). It occurs most frequently in persons under 5 years of age.¹⁸ Approximately 4 percent of those with esotropia have sensory esotropia.¹⁹

Consecutive Esotropia

A convergent strabismus that occurs after surgical overcorrection of an exotropia, consecutive esotropia is frequently associated with other oculomotor anomalies (e.g., vertical or cyclotorsional deviations). It may result in amblyopia and loss of normal binocular vision in young children and diplopia in adults.

Microtropia

Natural History: Microtropia frequently results from the treatment of a larger-angle esotropia or exotropia by optical correction, vision therapy, pharmacological agents, and/or extraocular muscle surgery. Microtropia can also occur idiopathically or secondary to anisometropia.^{92,94,95,}

Signs, Symptoms, and Complications: The patient with microtropia usually exhibits the following:

- A constant, unilateral esotropia of less than 10 PD at distance and near (constant, unilateral exotropia of less than 10 PD is rare)
- Amblyopia
- Eccentric fixation
- Rudimentary binocular vision
- Anomalous retinal correspondence
- Deficient stereopsis

- Anisometropia.

Early Detection and Prevention: Microtropia is usually diagnosed later than the more obvious types of strabismus; however, because of the high incidence of amblyopia, any child suspected of having microtropia should be evaluated immediately.

pd base out test: 4 pd base out prism in front of normal eye will not elicit refixation movement in a case of patient with microtropia.

A and V patterns

- A horizontal deviation may be different in upgaze versus downgaze, forming A and V patterns.
- A pattern shows more esotropia (or less exo) in upgaze
- V pattern shows more exotropia (or less eso) in downgaze.
- A pattern is significant if greater than 10 prism diopters.
- V pattern is significant if greater than 15 prism diopters.
- They are frequently associated with overaction of the oblique muscles:
 - a. Inferior oblique for V pattern
 - b. Superior oblique for A pattern.

Acute Concomitant Esotropia

- Refers to sudden onset of large angle concomitant esotropia without any paralytic element.
- Typically associated with diplopia.
- 2 types
 - After artificial interruption of fusion. ex prolonged bandaging of one eye, occlusion of one eye for treatment of amblyopia without squint.
 - Without preceding disruption of fusion.

Cyclic Esotropia

- Rare
- Characterized by a strabismic and a non strabismic phase of 24 hrs each.
- Cyclic nature may last from 4 mnths to several years, after which the cycle breaks & esotropia becomes constant.
- Onset-early childhood
- Deviation is usually 40pd-70 pd

Nystagmus Blockage Syndrome

- Occurrence of esotropia in a child with congenital nystagmus.

- To dampen the nystagmus there occurs adduction or excessive convergence which results in esotropia.
- Characterized in its acute form by an esotropia of early onset with a variable angle, changing from orthotropia with manifest nystagmus during period of visual inattention to esotropia without nystagmus during visual attention.
- Nystagmus intensity is inversely proportional to the angle of deviation.

Divergence Paralysis

- Concomitant esodeviation present at distance fixation in patients having normal ductions & versions.
- Etiology
 - Idiopathic

- Neurological disorders-encephilitis,tabs,head trauma,neoplasms,increased intracranial pressure.

C/f-history of sudden onset uncrossed diplopiia at distance fixation

- Differential diagnosis-
 - Sixth nerve palsy
 - Convergence spasm
- Treatment
 - Prismotherapy-base out prism may provide adequate relief from diplopia.

Surgery-condition does not disappear within 6 months, resection of both LR should be considered.