

Author: Ida Lucy Iacobucci, 2015

License: Unless otherwise noted, this material is made available under the terms of the Creative Commons Attribution-NonCommercial-Share Alike 4.0 License: <http://creativecommons.org/licenses/by-nc-sa/4.0/>

The University of Michigan Open.Michigan initiative has reviewed this material in accordance with U.S. Copyright Law and has tried to maximize your ability to use, share, and adapt it. Copyright holders of content included in this material should contact open.michigan@umich.edu with any questions, corrections, or clarification regarding the use of content.

For more information about how to attribute these materials, please visit:

<http://open.umich.edu/education/about/terms-of-use>.

Chapter 5

ESODEVIATION

An Esodeviation Is An Inward Turning Of One Eye

I. LATENT ESODEVIATIONS - COMITANT/INCOMITANT

A. General Information

Esophoria-latent inward deviation held in check by fusion. It may be comitant or incomitant. The amount of esophoria regarded as normal limits in adults is *2-3 prism diopters for distance* and near; normal range for children is slightly higher. *During illness, fatigue or emotional stress*, an esophoria may be intermittent.

Symptoms Objectively – watery appearance of eyes, congested conjunctiva.

Subjectively – headache, tiredness, rapid fatigue, blurriness of vision, symptoms associated with near work.

B. Types of Esophoria - Comitant

1. *Basic esophoria, intermittent esotropia* - recheck the refractive error.

a. Characteristics

1. Deviation equal in all gazes.
2. NPC is normal.
3. Convergence amplitudes are normal to high.
4. Divergence amplitudes are low.
5. Some suppression *usually present* (ET state).
6. Good stereopsis (but affected in ET state).

b. Tests – cover test 6 m and 1/3 m, right – left, up and down gaze.

c. Treatment – Only treat patients that have *symptoms*.

1. Check the refractive error.
2. Eliminate suppression, if present.

Teach diplopia in following situations, if $E(T)$ is produced by testing procedure and suppression is demonstrated:

- i. taking an NPC.
- ii. doing red glass test distance and near.
- iii. Worth Four Dot distance and near.

At the point where suppression is present, teach the patient to alternate with diplopia awareness with red glass and light. Place red filter in front of dominant eye at the point where suppression is present; flash your hand up and down in front of red filter eye until diplopia is elicited. If unable to maintain diplopia for fifty counts in the office, it is given as home practice five to ten minutes each day and a return visit in two or three weeks.

3. Stabilize fusion.

Once stable diplopia is elicited, the patient is given a red glass fusion practice. Begin where patient sees one fused (pink) image and advance (to 1/3 m) and recess (6 m) from that position. This practice is done in five minute sessions three times a day. Patient is seen in two to three weeks.

4. Additional anti-suppression.

Additional anti-suppression practices for distance and near fixation.

- a. Framing - (phenomenon of physiologic diplopia) is an excellent distance practice. Have patient fix at a distant object and place a pencil or finger in front of his eyes. He should be aware of two pencils or two fingers as they fuse the distant object.
- b. Bar reading – (phenomenon of physiologic diplopia) is an excellent near practice. While reading at near, hold a pencil (or finger or bar) in front of the book and patient should see two bars

(or two fingers or two pencils) while reading. If he loses part of the page, suppression is present.

5. Increase amplitudes of fusion.

Loose prisms are given as a home practice to increase relative fusional divergence and if indicated relative fusional convergence. The amount of base-in prism practice given is dependent upon the patient's performance in the office. The prism can be easily taped on the glasses. For example, if he blurs with a 3^{Δ} base-in prism with 20/30 target at distance but for near can accomplish a 10^{Δ} base-in; give the patient a 5^{Δ} base-in prism recession practice while looking at TV for 20 minutes each day (can break it up into five to ten minute intervals). Patient begins close to the TV to obtain a clear single picture and slowly moves away maintaining the image clear and single to six meters.

IMPORTANT: If the patient has intermittent suppression while doing base-in prism practices, use physiologic diplopia awareness as a check mark for the patient. (He holds a finger or pencil in front of his eyes and observes two fingers or two pencils while fixing the object of regard; then if one finger or pencil disappears, suppression is present).

6. Fresnel press-on prisms management.

If symptoms persist after normal amplitudes have been accomplished, the patient is given base-out Fresnel press-on prisms for the amount of esodeviation present. This method is used mainly in older children and adults. They are worn for two to three weeks as a trial period to evaluate improvement of symptoms. Should symptoms be relieved, slowly reduce strength of prism at $3\text{-}5^{\Delta}$ increments. If unsuccessful in reducing prism, permanent base-out prism in spectacles can be prescribed but the patient should be informed that the amount of base-out prism needed for comfortable binocular vision increases with passage of time.

7. Surgical management is dependent upon the amount of misalignment with or without press-on prism management

Surgery: Check if eso greater looking at distance and near, right-left and up & down gaze at distance fixation.

2. Divergence Insufficiency Type (Eso greater at distance) – esophoria or intermittent esotropia.
 - a. Etiology
Primary disorder may be associated with *hypokinetic innervational* influences or *intrinsic* defects in ocular motor mechanism. It could easily be secondary to prolonged convergence excess or associated with under corrected hyperopia. Patients frequently demonstrate a nervous or psychic instability.
 - b. Characteristics
 1. Usually of functional origin.
 2. Esodeviation greater for distance than near – increases with distance fixation.
 3. Comitant in all directions of gaze.
 4. Periods of fatigue may demonstrate ET with uncrossed diplopia.
 5. NPC normal.
 6. Minimal suppression.
 7. Prism divergence greatly reduced or absent.
 8. Prism convergence good.
 - c. Treatment
 1. Check the refractive error.
 2. Give red glass and penlight recession practice 15 minutes daily.
 3. Another method is physiologic awareness beginning at near with TV and recess to 6 meters maintaining 2 fingers or pencils and a single image.
 4. Attempt to improve fusional divergence (BI recession practice) though frequently ineffective.

5. Give Fresnel press-on prism equal to the amount of esodeviation to evaluate improvement of symptoms. An attempt can be made to gradually reduce prism.

NOTE: Since patient is ortho to minimal esophoria for near, the Fresnel prism is only placed on the upper segment of lens for distance fixation.

6. Surgical correction or ground-in prism may be considered.
3. Convergence Excess Type (esophoria – intermittent esotropia) – greater for near.

a. Characteristics

1. Associated with excessive accommodation or an abnormally high convergence response to accommodative impulse – high AC/A.
2. Esophoria greater for near than for distance.
3. NPC normal.
4. Convergence amplitude normal.
5. Divergence amplitude usually low, especially at near.
6. Suppression is frequently present.

b. Measurements

Measure the alignment with +1.00, +2.00, +3.00 add OU for near with accommodative target and repeat primary position measurement to evaluate the minimal strength needed to obtain stable fusion at distance and near.

c. Treatment

Same as for basic esophoria with these modifications:

1. Physiologic diplopia. Since the angle of deviation is greater at near and the fusional ability of the patient is greatly taxed, the introduction of any obstacle to binocularity (the object on which he is to appreciate physiologic diplopia) may cause a manifest deviation. Have the patient relax while looking at a distance object and gradually introduce a small stick (pick-up stick or Q-tip) in the midline close to the nose.

Gradually move the stick away from the patient to that distance where he is able to appreciate it in physiologic diplopia. If he crosses inward, move the stick back to the area of his nose and repeat until control is mastered. If the patient's fusional control is too unstable to perform this exercise, additional plus lenses for near should be given in an effort to control the deviation and allow fusion of a sufficiently stable quality to permit binocular training.

2. Increase fusional amplitude with emphasis on relative fusion divergence with base-in prism or minus lenses.
3. Bifocals may be prescribed by the ophthalmologist for those patients with a high latent deviation at near which, after maximum improvement of divergence amplitudes, continue to have symptoms or easily break down into an intermittent esotropia.
4. Plus lenses may be reduced gradually as quality of binocularity and fusional divergence amplitudes improve. Reduction of plus lenses is given *only* if the patient demonstrates no sacrifice of binocular function or discomfort with the weaker lenses.
5. Prisms are not generally prescribed for this condition except for press-on prism test preoperatively.

II. MANIFEST ESO DeviATIONS – COMITANT TYPES

- A. Congenital or Infantile Esotropia - Tonic-Type, constantly present under ordinary circumstances, but completely relieved by anesthesia.
 1. Characteristic
 - a. Early onset – within first three months of life.
 - b. Variable angle of squint but usually not accommodative.
 - c. May have moderate hyperopia.
 - d. Large deviation – 40^Δ or greater prism diopters of esotropia – may have vertical deviation as well.
 - e. Frequently alternating. If uniocular, amblyopia is usually present.
 - f. Cross fixation.

- g. No evidence of paresis.
- h. ARC and suppression may be present.

2. Treatment

- a. Refraction – 1% Cyclogyl.
- b. Patch to overcome amblyopia (*check fixation and following pattern*) and induced tropia test.
- c. Skin patch 4-6 hours a day – check at weekly intervals under *one year* of age and at two week intervals at two years or older. Continue patch program until good fixation with either eye before surgical management.
- d. Early surgery (3-4 months of age) is recommended. The procedure can be bimedial recessions or a recession-resection of one eye.
- e. If further surgery is indicated, usually within 3 months of last surgery.

B. Congenital or Infantile Esotropia – associated with high degree of myopia.

1. Etiology

Innervational type of strabismus associated with uncorrected high myopia. Convergent position of eyes allows good vision at near and child remains in eso position at all distances.

a. Characteristics

- 1. Moderate to high myopia.
- 2. Deep suppression, especially at distance fixation.

b. Treatment

- 1. Give full minus correction. Refract again in three months to uncover more myopia if present.
- 2. Wear correction at least six months. In most instances, child becomes straight with good fusion.

C. Orthoptics

- 1. Amblyopia – patch preferred eye three to four hours a day; check at weekly intervals until fixation is central and child can voluntarily fix with previous amblyopic eye.

2. Alternate the skin patch two to three hours a day to teach alternation.
3. Once good alternation is achieved, surgical management depends upon the amount of residual deviation. If the deviation is 15^Δ or greater press-on prism may be considered for one to two weeks to determine fusion potential.
4. If fusion or no fusion – surgical management depends upon the total amount of esodeviation with or without press-on prism management.

D. Accommodative Esotropia

Etiology is the relationship of accommodation to convergence. Whenever accommodation occurs, there is a *related amount* of convergence and the manner in which convergence is expressed is dependent on several factors.

E. Accommodative Esotropia – with normal AC/A ratio

This informs us that the child has an uncorrected hyperopia and he has to accommodate more than the normal (emmetropic) person for clear distance vision. *Accommodation* brings forth *accommodative convergence* in *proportion* to the patient's *AC/A ratio* and the amount of his *hypermetropia*. *Accommodative convergence* brought forth by accommodation would be in excess of that required for *bifoveal fixation*. If his amplitude of *relative fusional divergence* is insufficient to overcome this excessive convergence, esotropia will result each time *accommodation is exerted*. Since the AC/A ratio is normal, the situation for near is approximately the same as for distance. The angle of deviation will vary with the amount of accommodation exerted.

1. Characteristics

- a. Due to uncorrected hyperopia 2D to 5D.
- b. Relatively late onset – age two to three years.
- c. Intermittent at first – evident when child is tired, ill or upset.
- d. Deviation about the same for distance and near.
- e. Moderate angle esotropia (25-35 prism diopters).

- f. Because the angle is unstable and intermittent, ARC is not present.
 - g. Suppression usually present - with anisometropia.
 - h. Rarely amblyopia – except in children with anisometropia.
 - i. NPC to nose.
 - j. Fusion is demonstrated on the Synoptophore.
 - k. Convergence amplitudes good to excessive.
 - l. Divergence amplitudes fair to poor.
2. Testing - Initial orthoptic visit
- a. Cover test: use 20/30 target at 6 m and measure in primary position in addition to up, down, right and left gaze. At near on accommodative target at near with and without +3.00 clip-on's.
 - b. Red glass test for distance and near and Worth Four Dot flashlight at distance and near (check stereo with and without +3.00 add).
 - c. Amblyoscope findings if available.
3. Treatment
- a. Cyclogyl 1% refraction up to teenage age.
 - b. Give full hyperopic correction under school age and minimum hyperopic correction that allows *comfortable binocular vision* in school age children.
 - i. If amblyopia is present, hyperoptic correction is worn full-time for four to six weeks before initiating amblyopia treatment. In the majority of cases, once the eyes are aligned with the proper hyperoptic correction, visual acuity improves in the previously amblyopic eye.
 - ii. Eliminate amblyopia (usually minimal) by initiating skin occlusion or placing clear contact paper on the lens in front of the preferred eye. This is worn three to four hours daily until VA is equal to the good eye. Bangerter foils, which are worn full-time, could be considered as an alternate method in amblyopia patient.

- iii. Anti-suppression practice with the red filter and penlight is excellent if only intermittent diplopia is present. This can be performed 20 minutes daily at five minute intervals with the red filter in front of the preferred eye and maintain a single pink (red and white mixed) from to the bridge of the nose to a distance of six meters. Have the child do additional exercises such as red drawing, coloring, beading, etc., with the red filter over the preferred eye.
- iv. Physiologic diplopia awareness can be while looking at TV from 1/3 meter to six meters if suppression continues to be a problem.
- v. Patient is seen at three to four week intervals until VA is equal and comfortable and stable fusion is maintained with good stereopsis. Patient can be monitored at three to four month intervals and refraction should be performed yearly.
- vi. On return visit for a yearly refraction, determine if the *plus* lens can be reduced. Begin with 1.00 clip-on lens and wait at least 20 minutes to determine if equal VA is maintained with stable fusion at distance and near.
- vii. Residual esotropia is still present with the first prescription, check if more plus is indicated (+1.00 clips). If no change and the angle of esotropia is less than 12 prism diopter, equal VA, with or without peripheral fusion, just monitor the patient at four to six month intervals. If the residual ET is 20^Δ or greater, with or without fusion potential, additional surgery may be considered.

A. Accommodative Esotropia – with high AC/A ratio (convergence-excess)

1. Etiology

The refractive error in this type of esotropia is not the primary factor. These patients may be *emmetropic*, *hyperopic*, or even *myopic*. It is common, however, to see a *moderate hypermetropic refractive error*.

Characterized by a high AC/A ratio, the excessive convergence for near may be due to a general weakness of accommodation (hypoaccommodation) or it may be due to excessive accommodation to convergence responses.

IMPORTANT: Observe in causal seeing – patient may be phoric or intermittent.

2. Characteristics

- a. Relatively late onset – age two to three years.
- b. Deviation is greater for near (*10-15 prism diopters*).
- c. Remote *NPA* but not always present.
- d. Amblyopia is rare due to *variability of the angle*.
- e. Convergence amplitude high to normal.
- f. Divergence amplitudes low.
- g. Suppression more common than with normal AC/A ratio-type deviation. (Suppression in ET state especially for near.)

3. Treatment

- a. Proper correction of refractive error.
- b. Bifocals in amount necessary to provide *bifoveal fusion* for near. (+2.50 or +3.00 executive type at lower pupillary margin).
- c. Anti-suppression practices.
 - i. Doing red work, drawing, coloring, etc. with red filter over preferred eye looking through bifocal.
 - ii. Do physiological diplopia awareness while reading through the bifocal holding pencil in front of the page.
- d. Increase relative fusional *divergence with base-in prism* through bifocal. If concerned that patient may suppress with prism practice, have him be aware of physiologic diplopia while reading through bifocals.

- e. Reduction of bifocals – reduction of bifocals usually begins at ages six to seven years. This could easily be performed in the office. Place a -1.00 sphere clip on lens OU in the office and have patient wear them 20 minutes in the waiting room, if phoric thru the bifocal, a permanent reduction in bifocal lens is prescribed.

If still ET with -1.00 sphere clip then attempt to reduce bifocal in another six months. In cases in which bifocals cannot be eliminated, surgery may be considered in early teens.

B. Acquired Esotropia

Could have had a period of *bifoveal single vision* before deviation became manifested. Accommodative, motor, or innervational anomalies could have caused the esotropia but frequently an optical deficiency is usually the case in this group (eg. anisometropia, uncorrected accommodative ET).

1. Characteristics
 - a. Age of onset one to five years.
 - b. May be hyperopic but esotropia not relieved with glasses.
 - c. Frequently *alternates* but when uniocular, suppression and amblyopia are often present.
 - d. ARC may be present especially in a constant angle.
 - e. Angle of deviation steadily increases because of secondary contraction of the muscle and is usually large (35^{Δ} or greater).
 - f. No paresis present and is relieved by anesthesia.
2. Treatment (Check the refractive error.)
 - a. Overcome amblyopia (occlusion as discussed in amblyopia lecture).
 - b. Surgery is determined:
 - i. Amount of deviation D&N, right, left, up and down gaze at distance.
 - ii. Presence or absence of fusion – evaluate with the synoptophore or press-on prisms to prognosticate sensory or motor response.
 - iii. If ARC – more aggressive surgical procedures

3. Postop Treatment
 - a. 15^Δ or less phoric to intermittent esodeviation. Just follow at two to three month intervals. If concerned with suppression, teach patient physiologic diplopia awareness and increase relative fusional divergence and convergence amplitudes with BI and BO prisms.
 - b. 20^Δ or greater. Initiate base-out press-on prisms to prognosticate the presence of fusion and potential for good alignment. Patient is seen in one or two weeks to evaluate the response to decide surgical management.

IMPORTANT: In postop secondary XT – reduce the plus correction. If reduction in plus is unsuccessful, press-on prisms can be considered to determine surgery management.

C. Nonaccommodative Esotropia

Due to anatomical anomalies or to an early paresis which has become comitant.

1. Characteristics
 - a. Early onset.
 - b. Deviation generally large (40^Δ or more) and usually basic type.
 - c. May be uniocular or alternating.
 - d. Deep suppression and amblyopia may be present.
 - e. ARC may be present because of a constant angle.
2. Management
 - a. Check refractive error.
 - b. Treat amblyopia and suppression as previously described in amblyopia section in children.
 - c. In adult patients consider press-on prisms to determine the sensory and motor response preoperatively.
 - d. *Surgery is determined for total amount of esodeviation.*
3. Post-op Treatment - Similar to acquired esotropia group.

D. Mixed-type Esotropia.

Referred to as partially accommodative Esotropia.

1. Characteristics

Comprised of an accommodative and nonaccommodative components. Same characteristics as in accommodative Esotropia and nonaccommodative Esotropia except the residual deviation (nonaccommodative portion) may vary from a small to moderate nonaccommodative angle of esodeviation.

2. Treatment

As indicated for component parts, as outlined in Accommodative and Nonaccommodative Esotropia.

- a. Wear full hyperopic correction for two months.
- b. Eliminate amblyopia – follow amblyopia lecture.
- c. Surgery is performed for the nonaccommodative portion (residual ET with hyperopia correction). Press-on prisms may be useful to determine fusion potential preoperatively.
- d. Post-op treatment – follow same post-op treatment for acquired ET.

E. Phoria-Tropia or Monofixation Esotropia

Sometimes called: Monofixation syndrome, micro-strabismus, phoria-tropia, ET flick, retinal slip.

1. Characteristics

- a. Less than 10 prism diopters of heterotropia. With simultaneous prism and cover test, usually 2-6^Δ.
- b. Angle increases with alternate cover test.
- c. VA is often one line lower in the non-fixing eye.
- d. Stereopsis is present (usually not more than 67%).
- e. May be central or slightly eccentric on visuscope or ophthalmoscope.
- f. Harmonious ARC.
- g. Demonstrates a three degree facultative scotoma in visual field of non-fixing eye during binocular fixation.
- h. Fusional vergences are present.

2. Causes
 - a. Strabismic history.
 - b. Anisometropia.
 - c. Unioocular macular lesion.
 - d. Amblyopia.
 - e. Eccentric fixation.
3. Tests
 - a. Simultaneous prism and cover with prism over non-fixing eye.
 - b. 4 Base-out Test – absence of movement is interpreted as proof of scotoma (out movement not in).
 - c. Worth 4 Dot – claims four for near, demonstrate suppression for distance.
4. Treatment

If no symptoms, leave alone. If symptoms, increase fusional amplitudes from subjective angle on synoptophore. Also can be done in free spaces with BI and BO prisms with the small tropia – just look at re-fixation movement.

F. Blind Spot Syndrome

Condition may occur spontaneously or following a surgically reduced large angle esotropia or over-corrected XT. An accommodative element may or may not be present. There are *no* associated sensory anomalies.

1. Characteristics
 - a. ET 12 to 18 degrees (25-35 prism diopters), may have coexistent vertical deviation up to 10 prism diopters.
 - b. Good vision in each eye.
 - c. NRC.
 - d. Fusion demonstrated on the synoptophore; frequently with stereopsis and amplitudes.
 - e. No suppression, diplopia easily recognized when prism is placed before the deviating eye and the image is displaced out of the blind spot.
 - f. Transitory diplopia may be present.
 - g. Easily confirmed with Lancaster Red-Green Test which is a fovea-to-fovea test.

3. Treatment
 - a. Correct hyperopia if present.
 - b. Place a base-out press-on prism in front of the preferred eye or equally in front of both eyes in the amount to neutralize or slightly over-correct the deviation. In this way, the patient is fusing constantly pre-op and establishing amplitudes of fusion.
 - c. Orthoptic office treatment can be given on the synoptophore (from the objective angle) to increase relative fusional divergence and convergence amplitudes.
 - d. Surgery.

G. Blind Spot Mechanism

Mechanism differs from the syndrome by presence of sensory anomalies.

1. Characteristics
 - a. ET 12 to 18 degrees ($25-35^\Delta$) with possible vertical deviation up to 5 prism diopters.
 - b. Suppression, amblyopia, ARC or a combination of the three present.
2. Treatment
 - a. Correct refractive error.
 - b. Treat amblyopia.
 - c. Teach alternation.
 - d. To evaluate preop alignment, place BO press-on prism in front of preferred eye in children and non-preferred eye in adults in amount to neutralize or slightly over-correct deviation. Surgery is determined on the total amount of prisms prescribed.

H. Lancaster Red-Green Test

Diagnostic Method of Confirming the Blind Spot Syndrome or Mechanism

1. To determine if image of the deviated eye falls in the blind spot with the Lancaster Red-Green Test:
 - a. Place the patient at a distance of 1 meter from the tangent screen. Determine the blind spot in the visual field for each eye and plot it on the screen. This is a fovea to fovea test.
 - b. Patient is give red-green goggles (red-OD, green-OS) and one of the hand torches (e.g. red) is held by the patient and the other (e.g. green) torch is held by the examiner. The light held by the examiner (e.g. green) determines the fixing eye.
 - c. The examiner places his green light straight ahead at 0 and the patient is asked to superimpose his red light on the green light.
 - d. If the patient place his red light in the blind spot (plotted on the tangent screen) of the left eye, a blind spot syndrome or mechanism is present.

III. Manifest Esodeviations – Incomitant Types

A. Strabismus Fixus

1. Etiology
Due to *rigid, fibrous, short medial rectus muscle* attached by a *broad fibrous area to the sclera near the equator*. Fixes the eye in a position of adduction with *complete loss of abduction*.
2. Characteristics
 - a. It is *congenital*.
 - b. Both eyes in *adducted position* (one may be *affected more than the other*) with $50+^A$ ET.
 - c. Absence or extreme limitation of *abduction*.
 - d. *Restricted rotations externally on forced duction*.
 - e. Cross-fixation present.
 - f. *May be limitation of elevation and depression*.
 - g. *Compensates for lack of lateral rotation* with head movements.
3. Treatment - Surgery

B. Nystagmus Blockage Syndrome

Rare cause early onset of comitant esotropia

1. Onset of esotropia in early infancy-described by Cuppers.
2. Pseudo-abducens paralysis.
3. Head turn toward the side of the fixating eye.
4. Absence of nystagmus with the fixating eye in adduction.
5. Appearance of a manifest nystagmus as the fixating eye moved into primary position and abduction.
6. Convergence blocks the nystagmus.
7. Esotropia is caused by sustained convergence and secondary changes in the medial rectus muscle.

C. Ciancia Syndrome

1. Described in 1962 as a syndrome of infantile esotropia with abduction nystagmus.
2. ET early onset.
3. Large angle ET.
4. Bilateral limitation of abduction.
5. Jerk nystagmus with quick phase toward the side of fixating eye.
6. Increase in abduction and disappearing in adduction.
7. Torticollis with face turn toward side of fixating eye.
8. Moderate or absent hyperopia.
9. Head tilting toward side of fixating eye.

Summary: Ciancia syndrome, nystagmus blockage and large angle congenital esotropia – very sensitive characteristics and may be part of the spectrum of same condition.

D. Paretic Esotropia (Recent Onset - Abducens Palsy/6th Nerve Palsy/Lateral Rectus Palsy)

1. Characteristics

- a. Angle of squint varies with each eye fixing and varies in fields of gaze.
- b. Limitation of the lateral rectus muscle or overshoot of medial rectus on horizontal gaze.
- c. Compensatory head posture to eliminate diplopia.
- d. Past-pointing present due to diplopia.
- e. NRC is present.
- f. Symptoms are diplopia, vertigo, dizziness, nausea, etc. These symptoms rapidly disappear in children but last in varying degrees in adults. It rarely is permanent except with a neuropathic type of patient.

2. Treatment

- a. Use press-on prism in front of the paretic eye to prevent secondary contracture in the amount to neutralize the deviation. If patient is too young or too uncomfortable with prisms, alternate patch to eliminate diplopia.
- b. Wait until deviation stabilizes. Usually six months but it may be as long as one year.
- c. Surgery.

E. Paretic Esotropia (long-standing)

1. Characteristics

- a. Measurements become comitant with time.
- b. Secondary contracture may be present but rare in congenital cases.
- c. No past-pointing present since no diplopia present.
- d. Suppression, amblyopia (depth depends on age of onset) and ARC may be present.
- e. Compensatory head posture may not be present.

2. Treatment

- a. Eliminate suppression and amblyopia as indicated in previous lectures in children.
- b. If ARC present, must be more aggressive in surgical management.

- c. If fusion potential is questionable, attempt a two to four week trial with press-on prisms as described in *Acquired Esotropia*.
 - d. Surgery.
3. Postop Treatment
- b. If fusion is present, stabilize with BI and BO prism amplitude training.
 - c. No fusion: If VA is equal and angle of deviation is 20^Δ or less with SPCT the patient looks acceptable cosmetically, further treatment not indicated. The patient may establish gross fusion at this smaller angle.
 - d. If cosmetically not acceptable, an additional procedure is done on the opposite eye.

F. Duane's Retraction Syndrome

1. Etiology

In typical patients, it is generally thought that the lateral rectus of the affected eye is replaced by a fibrotic band. In some instances, fibrous medial recti have been found. Investigation has shown electromyography has led to the conclusion that in most cases there is a super nuclear lesion (simultaneous stimulation of both the lateral rectus and medial rectus muscles cranial 3rd nerve afferently innervates lateral rectus) present alone or in combination with abnormality of the muscle.

2. Characteristics

- a. Patient may or may not have a minimal to a significant face turn to the side of the affected eye.
- b. Good fusion usually present.
- c. Abduction of the affected eye is nil or limited to a few degrees past midline.
- e. Minimal restriction of adduction of the affected eye on versions and forced ductions.
- f. Retraction of globe on attempted adduction.
- g. Narrowing of palpebral fissure on adduction of affected eye; widening on attempted abduction.
- h. Upshoot or downshoot of the affected eye on adduction.
- i. Usually unilateral, may be bilateral.
- i. In some case, may have reversed findings, Type II.

3. Treatment

Surgery, if patient has a significant face turn.

- Type I - Widening of palpebral fissure on attempted abduction.
Narrowing of palpebral fissure on attempted adduction with retraction of the globe.
Esophoria, Intermittent ET, Esotropia
- Type II – Widening of palpebral fissure on attempted abduction and narrowing on attempted adduction with retraction of the globe - XT.
Exophoria, Intermittent XT and Exotropia.
- Type III – No abduction or adduction and narrowing and widening of palpebral fissure still present.
Minimal to no deviation in primary position - ET or XT.