

STRABISMUS

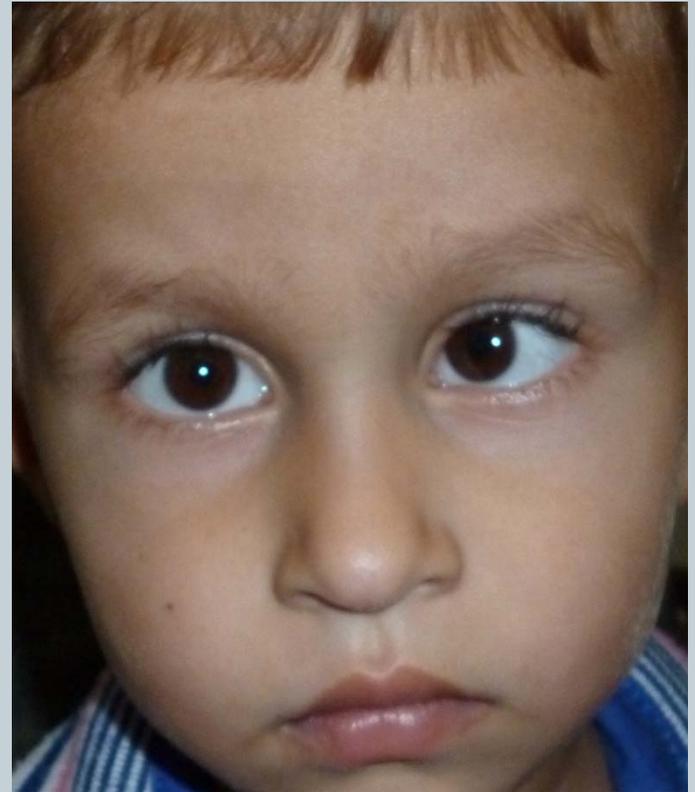


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Strabismus

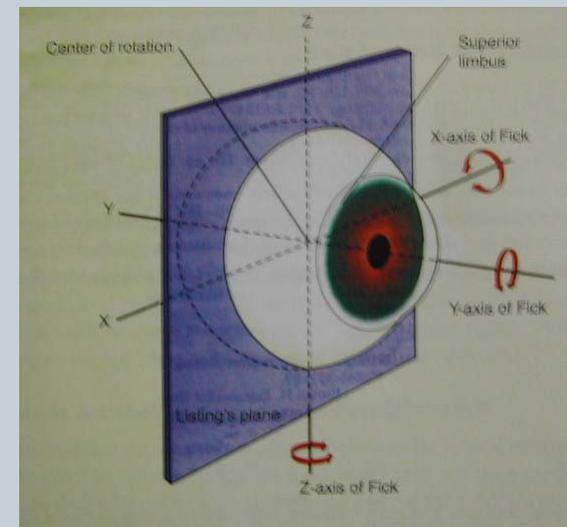
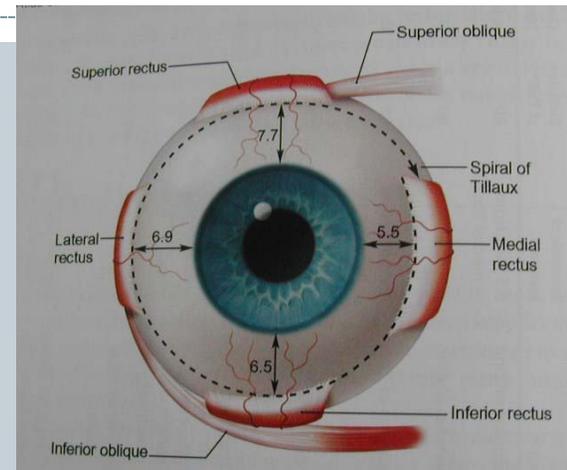


- Misalignment of eyes
- Abnormality of binocular vision or neuro-muscular control of eyes
- Orthophoria is ideal
- Small heterophoria is common
- Pseudostrabismus, heterophoria, heterotropia
- Horizontal, vertical, cyclovertical, or combination



Anatomy of Extra-ocular muscles

- 4 Recti and 2 Obliques
- Origin at Annulus of Zinn, except for IO
- Attached to sclera
- Nerve supply; 3,4 and 6th
- 3 axis;x,y,z
- Actions:
 1. Ductions and versions
 2. Conjugate; primary, secondary, tertiary
 3. Disconjugate: Convergence and Divergence



Law of ocular movements



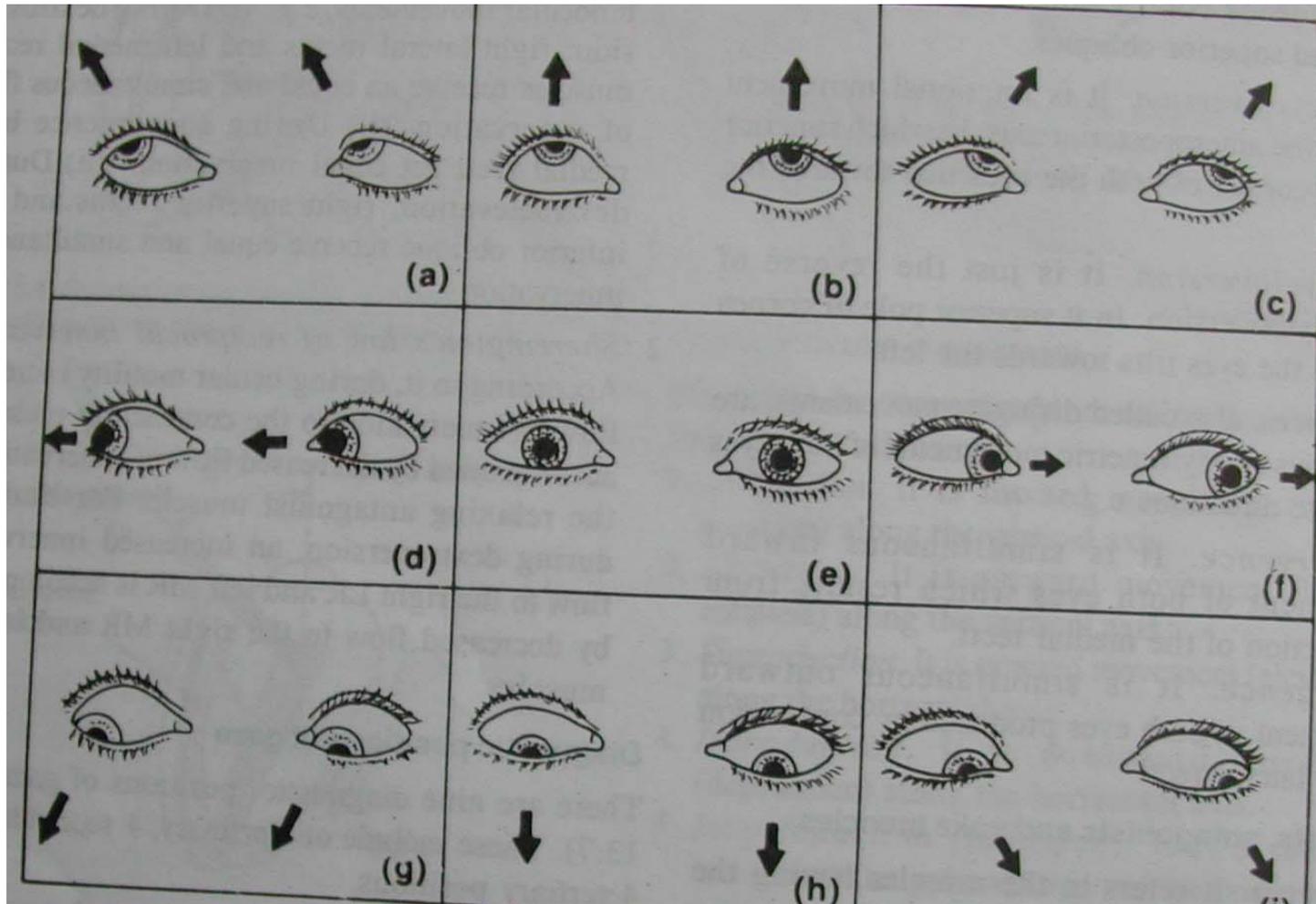
- Hering's Law: **simultaneous** and **equal** innervation to yoke muscles
- Sherrington's Law: law of **reciprocal innervation**; agonist and antagonist, when agonist contracts, antagonist relaxes

Actions of EOM



9 diagnostic positions of gaze

- **Primary:** straight primary position
- **Secondary:** up, down, right, left in straight position
- **Tertiary:** combinations of horizontal and vertical muscle actions; dextroelevation, dextrodepression, levelevation, levodepression
- **Cardinal positions:** when yolk muscles work in their main field of action: 2 horizontal and 4 tertiary positions

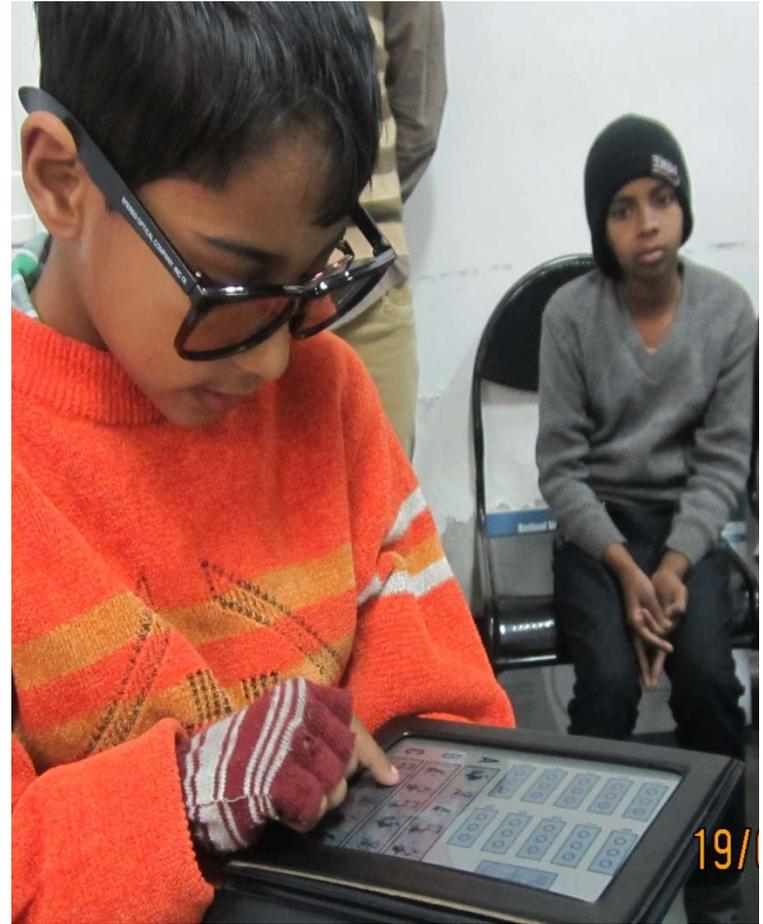


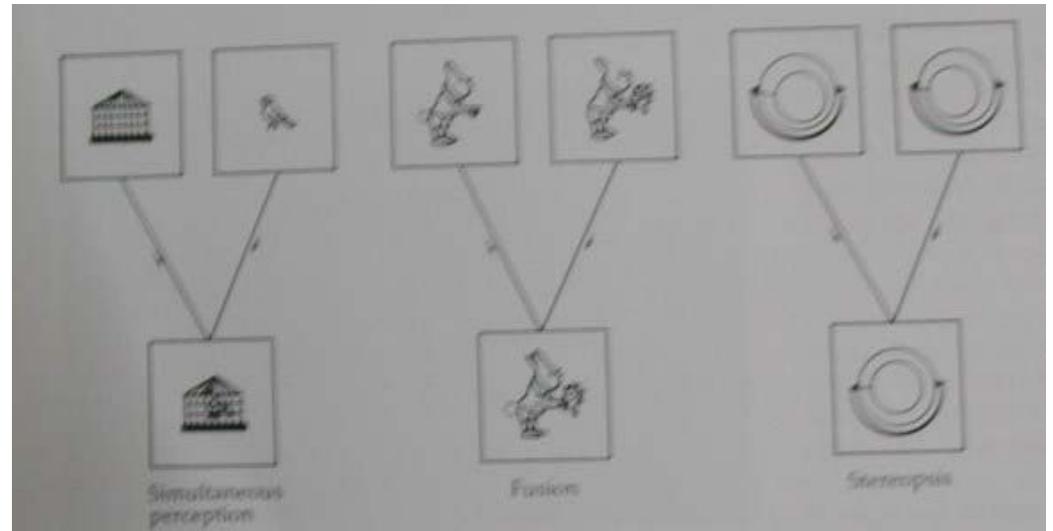
CARDINAL POSITIONS OF GAZE

Binocular Vision



- Using two eyes for same target and perceiving it as one
- Develops during first 6 months of life
- Good distance vision and nearly equal vision in both eyes, straight eyes, normal visual cortex
- 3 grades: SMP, Fusion (convergence and divergence range, Stereopsis)





Abnormalities of BSV: Sensory adaptation

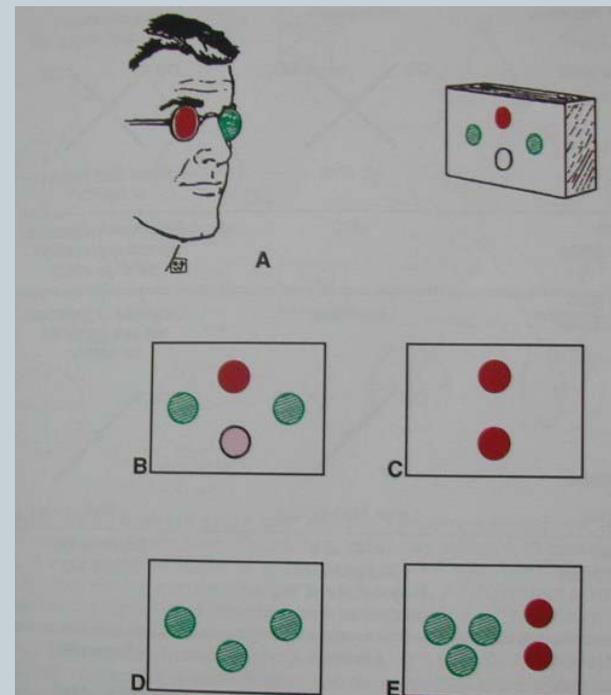


- **Suppression**
- **Amblyopia**
- **Abnormal retinal correspondence**

Suppression



- Binocular phenomenon
- One eye or alternate
- WFDT, Bagolini
- Facultative or obligatory
- Central or peripheral



Amblyopia

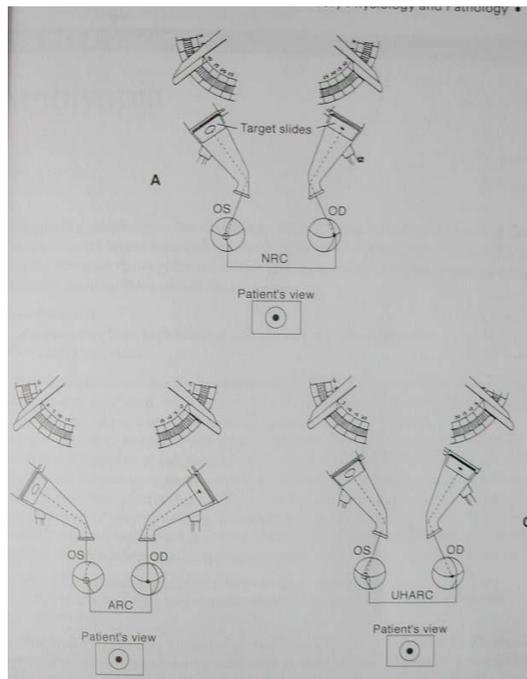
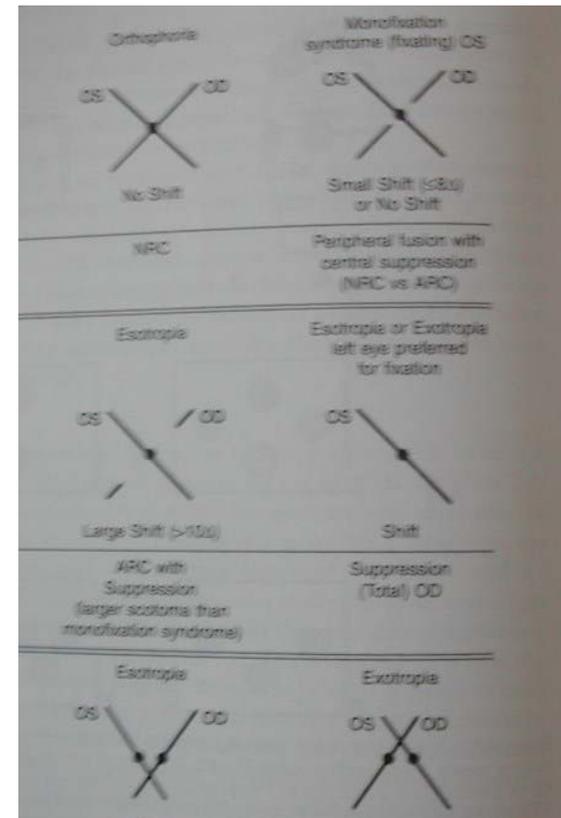
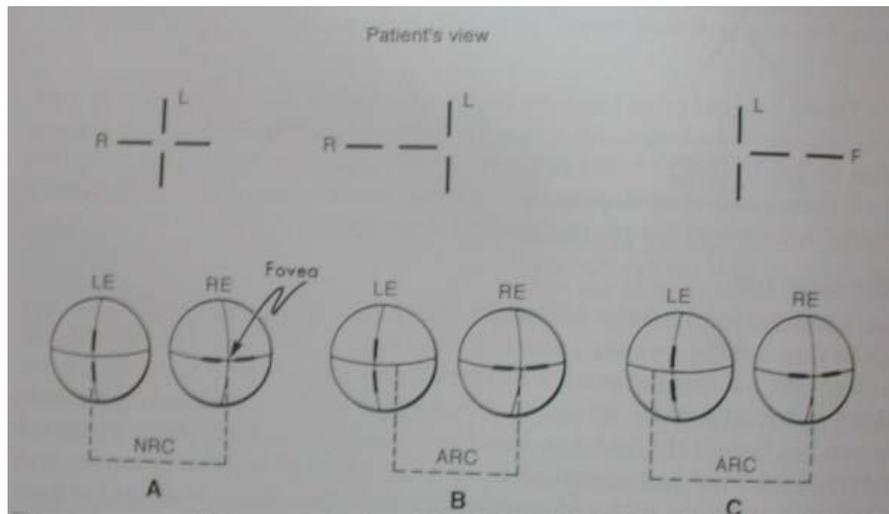


- Reduced form vision or abnormal binocular interaction with normal eyes.
- Unocular or binocular.
- Ocular structures are normal
- Prevalence 2-4% in school children
- Classification: **Strabismic**,
Anisometropic (isometropic, meridional),
Deprivation (cataract, ptosis, corneal opacity)
- Treatment: Occlusion, pinlization, levodopa

Abnormal retinal correspondence



- **Normal: bifoveal**
- **Abnormal : one fovea and other extra-foveal point to achieve some grade of BSV**
- **Tests: WFDT, Bagolini striated glasses, after image test, synaptophore test**



Squint classificaton



- Pseudostrabismus : telecanthus, epicanthal fold, negative and large positive angle kappa, less or more IPD, hypertelorism
- Heterophoria
- Manifest squint

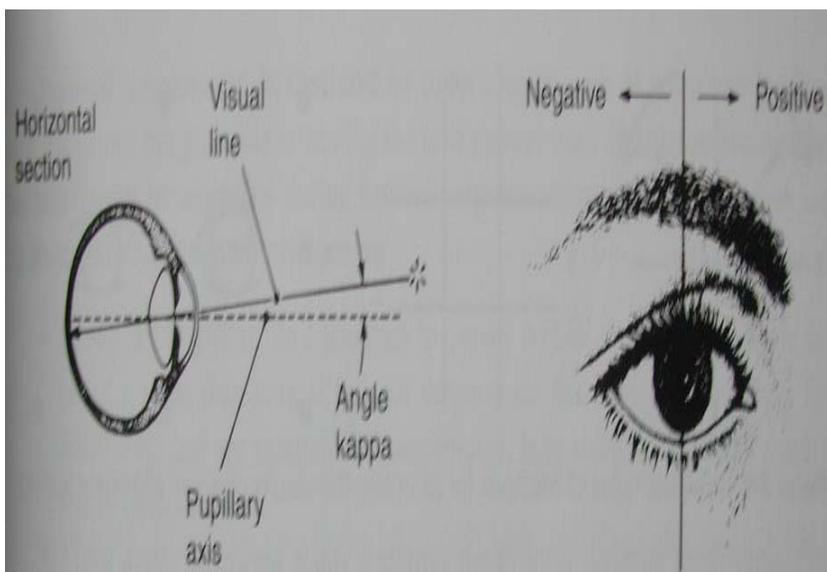
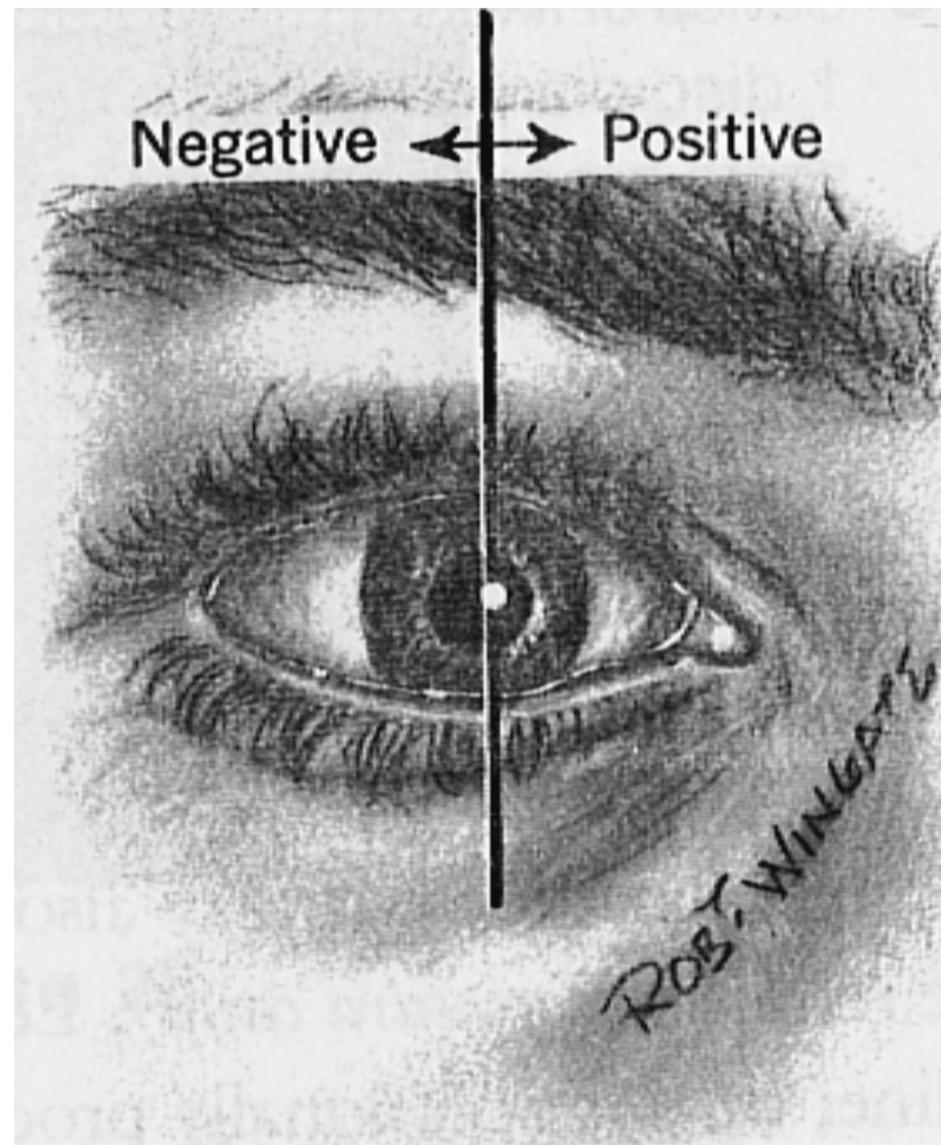
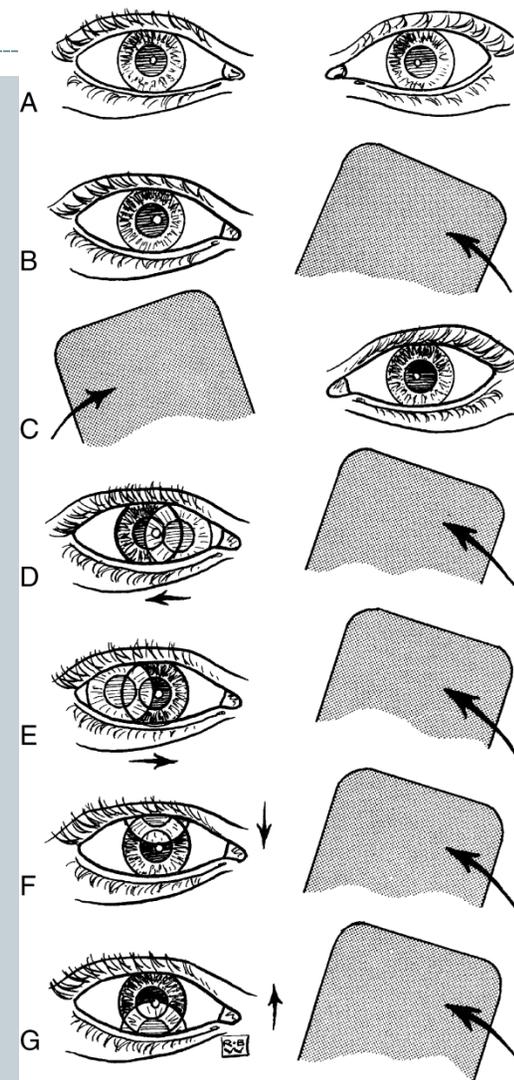


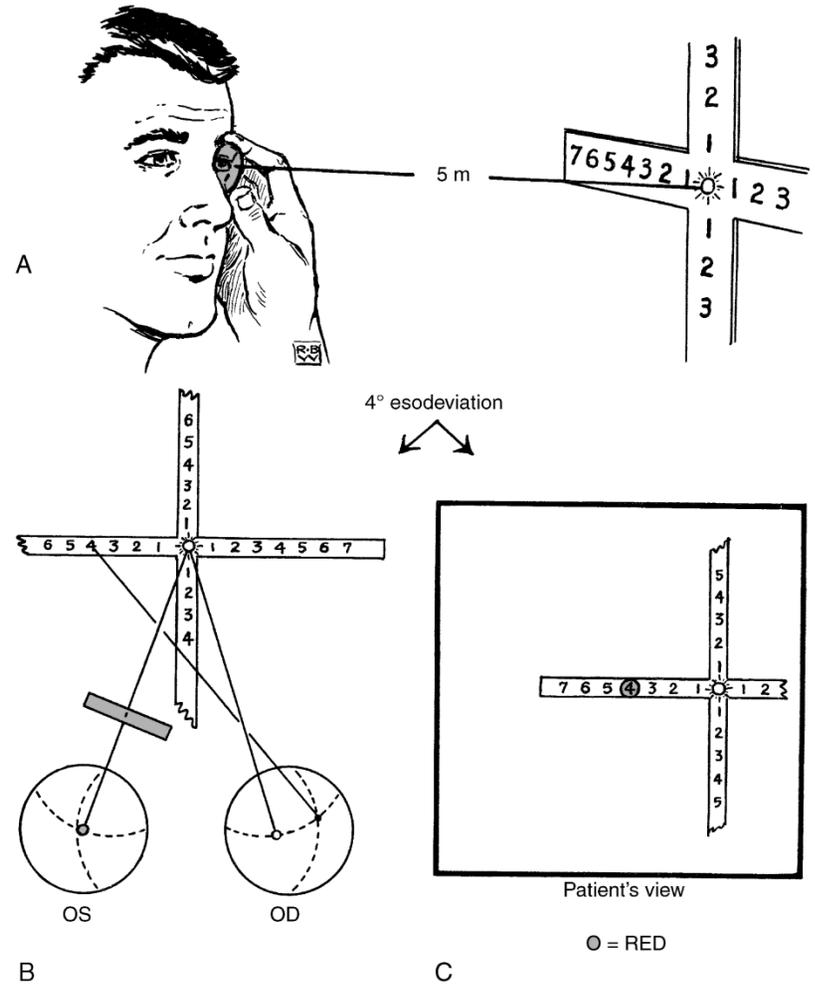
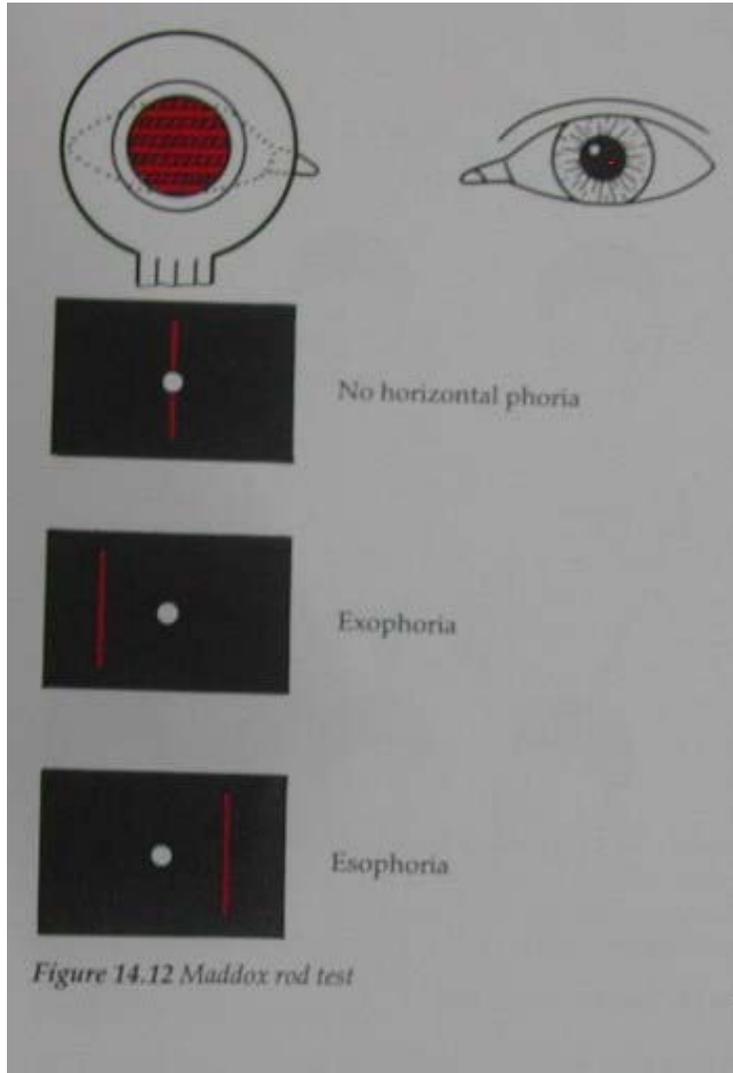
Figure 6-5 Angle kappa. A positive angle kappa simulates exotropia, whereas a negative angle kappa simulates esotropia. (Reprinted from Parks MM. *Ocular Motility and Strabismus*. Hagerstown, MD: Harper & Row, 1975.)



Heterophorias (latent squint)

- Fusion keeps the eyes straight
- Less fusional reserve
- Refractive error
- Eso/Exo/vertical/cyclovertical
- Asthenopia, diplopia, eye fatigue
- Cover/uncover test
- Meddox rod test for distance
- Meddox wing for near
- Measurement by prism cover test
- Fusional range: NPC/NPA
- Treatment: RE correction, exercises, prisms, surgery

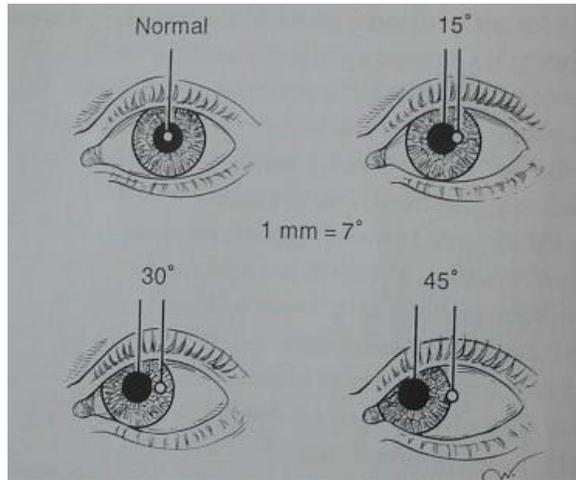




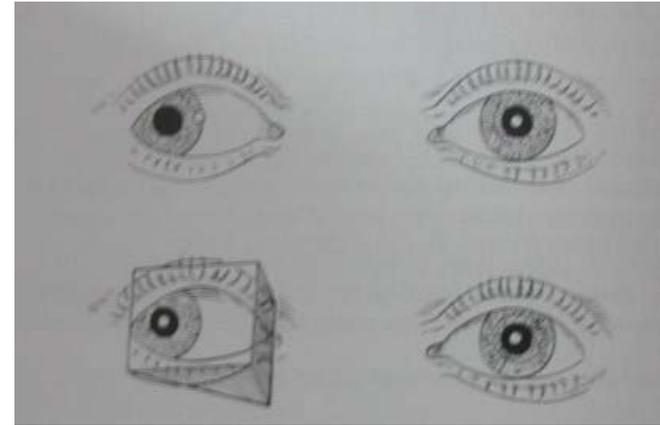
Manifest Squint:Heterotropia



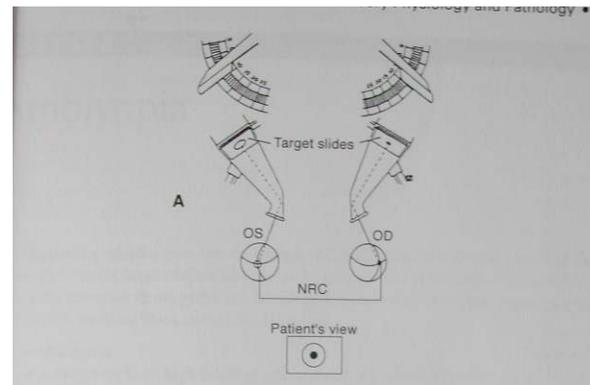
- **Most common form**
- **Eso/exo/vertical/cyclovertical**
- **Unilateral/alternate**
- **Unilateral associated with poor vision**
- **Cover/uncover test**
- **Hirschberg test, Krimsky reflex test, PBCT, synaptophore**
- **Ocular movements**
- **Binocular vision status:SMP/Fusion/Stereopsis**
- **Supression/amblyopia/ARC**



Hirschberg test



PBCT



Synaptophore test

Squint work up



- Pseudostrabismus, Heterophopia or Tropia
- Cover and uncover test and alternate cover test
- Squint measurement; Hirschberg, Krimsky, PBCT, synaptophore
- Measurement for distance and near
- Ocular movements
- Cyclolegic refraction: atropine/homatropine
- Fundus examination

Classification of Manifest Squint



COMITANT

INCOMITANT

SECONDARY

Esotropia, Exotropia, Hypertropia, Cyclotropia

Comitant Esotropia



- Most common type
- Types: Primary
 - Accommodative;
 - refractive,
 - non-refractive (High AC/A ratio)
 - partial accommodative
 - Non-accommodative;
 - Essential Infantile Esotropia (congenital esotropia)
 - Late on set basic
 - Microtopia
 - Cyclic esotropia
- Secondary
- Consecutive

Essential Infantile Esotropia



- Most common
- Onset <6 months
- Small refractive error
- Large angle >30 PD
- Alternate
- Nystagmus
- Limited abduction
- Cross fixation
- IOOA or DVD associated
- Needs surgery



Accommodative

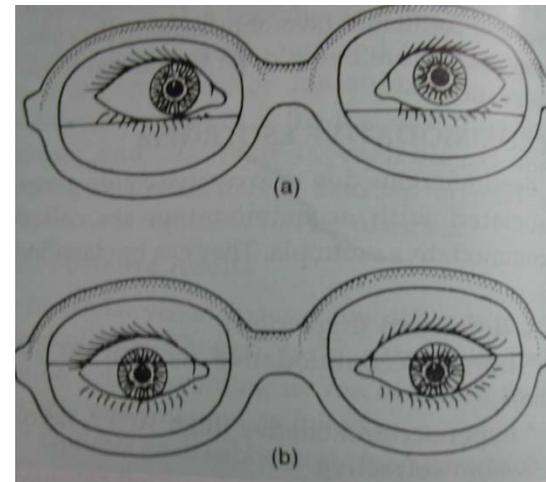


- Onset after 2 years
- Deviation more for near
- Large refractive error in refractive
- High AC/A ration in non-refractive
- Correction by glasses; refractive
- Bifocals for high AC/A ratio
- Surgery for partial accommodative





**Accommodative Esotropia:
AC/A ratio high**



Basic Esotropia



- Late on set
- Small refractive error
- Same for distance and near
- A or V phenomenon
- Cycloplegic refraction
- Surgery

Exotropia



- **Outward deviation of eye**
- **Intermittent or constant**
- **Primary**
- **Secondary**
- **Consecutive**



Primary exotropia



Four types

- **Divergent excess**
- **Convergent insufficiency**
- **Basic**
- **Simulated divergent excess type**
- Initially intermittent later constant
- A or V pattern, DVD, IOOA, SOOA
- Treatment: glasses, fusional exercises, prisms, surgery



Incomitant Strabismus



- **Paralytic:** any nerve palsy, myopathies, Myasthenia Gravis
- **Restrictive:** DRS, Brown syndrome, thyroid myopathy, floor fracture, fibrosis syndrome
- **Special types:** A/V phenomenon, DVD



Paralytic



- Sudden onset
- Headache, nausea, vomiting
- Diplopia
- Associated neurological features
- Primary deviation < secondary deviation
- Head posture
- Restricted movement
- False pointing





Paralytic Vs Comitant

- Onset: Sudden
- Precipitating event: present
- Age: Late
- Symptom: Diplopia
- Ass sym: headache
- Other neurological signs present
- Head posture: present
- Cyclotropia: present
- Past pointing: present
- Sensory adaptation: absent

- Gradual
- Absent
- Pediatric
- Usually no diplopia
- No headache
- Absent
- Absent
- No
- No
- Present

Sequales of Muscle Palsy



- Overaction of contralateral synergist (yoke muscle) MR of other eye in LR palsy
- Contracture of direct antagonist; MR of same eye
- Secondary inhibitional palsy of contralateral antagonist; LR of other eye

Types of Palsies



- **Single muscle palsy; LR or SO**
- **Multiple muscles palsy; 3rd N, complete ophthalmoplegia; all nerves**
- **Pupil sparing or involved; external/internal**
- **Total ophthalmoplegia**
- **Internuclear ophthalmoplegia;MLF lesions**
- **Accommodation paralysis; drugs**

Etiology of paralytic



- **Congenital**
- **Inflammatory**
- **Neoplastic**
- **Vascular; DM, hypertension, aneurysms**
- **Trauma**
- **Toxic; poisoning, diphtheria, alcohol, lead**
- **Demyelination; MS**
- **Myaesthesia Gravis**

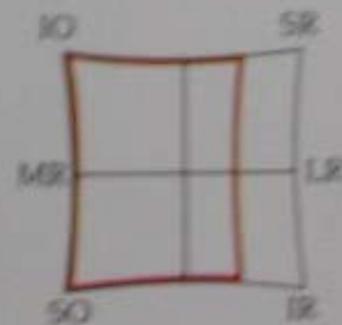
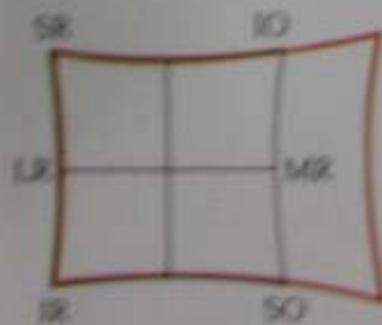
Work up



- Examination for cause
- Blood investigations, CT scan
- Tensilon test for MG
- Diplopia charting
- Lees Charting
- FDT
- Management: cause, prisms, patching, surgery



Figure 14.15 Lens screen



Management



- **Treatment of cause**
- **Temporary measures for diplopia; prisms, occlusion**
- **Botulinum A injection**
- **Surgical: recession/resection, transposition once deviation stable.**

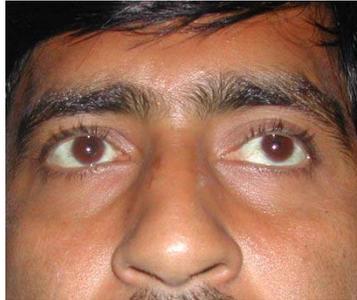
Special forms of squint



- **Duane's retraction syndrome**
- **Brown syndrome**
- **Double elevator palsy**
- **Progressive external ophthalmoplegia**

DRS SYND





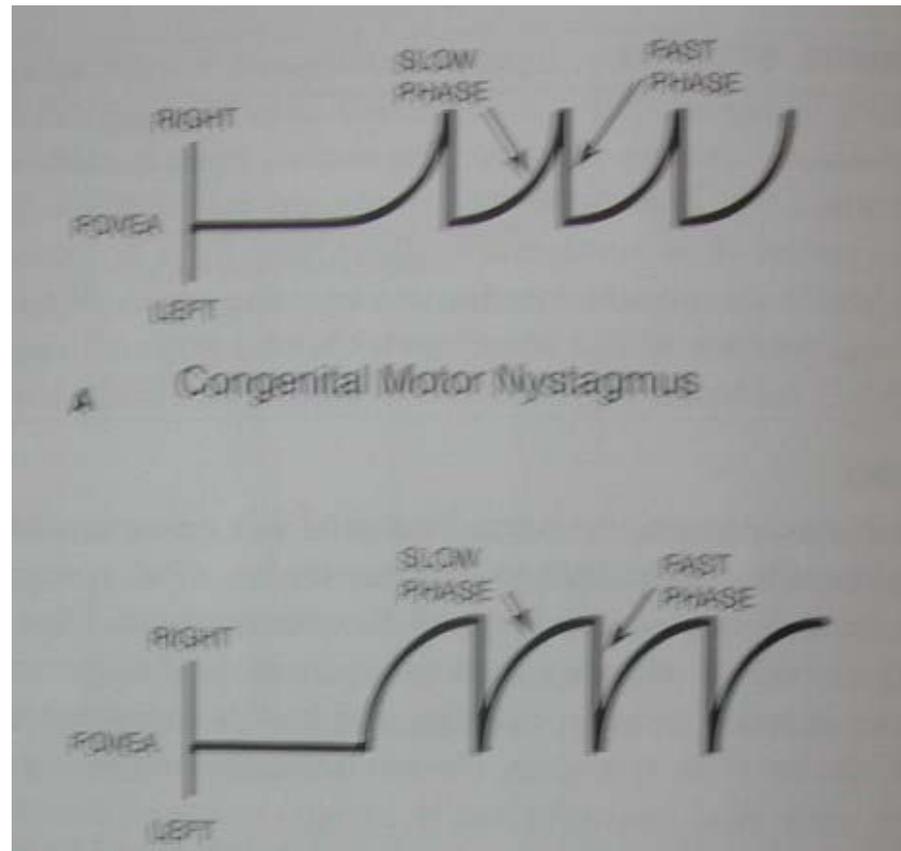
LEFT EYE 4TH N PALSY



Nystagmus

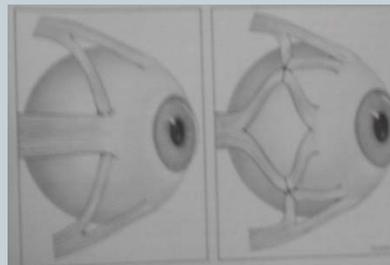
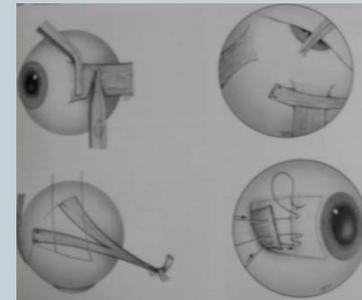
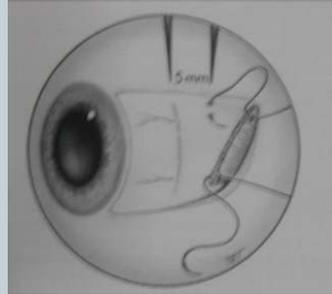


- To and fro movement of eye; regular and rhythmic
- Involuntary movements of eye
- Pendular or jerk type
- Latent or manifest
- Horizontal or vertical (up-beat, down-beat), see-saw
- Physiological, pathological
- Vestibular
- Ocular causes, Brain stem lesions, cerebellar, drug toxicity



Muscle surgeries

- Weakening; recession, Z plasty, myectomy
- Strengthening; resection, advancement, tucking
- Transposition; attach normal muscle to weak muscle



Thanks