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 vertions
  - 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
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, levoelevation, 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.
- Uniocular 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 classification

- 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
Figure 14.12 Maddox rod test

No horizontal phoria

Exophoria

Esophoria
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
<table>
<thead>
<tr>
<th>Paralytic Vs Comitant</th>
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<tbody>
<tr>
<td>• Onset: Sudden</td>
</tr>
<tr>
<td>• Precipatating event: present</td>
</tr>
<tr>
<td>• Age: Late</td>
</tr>
<tr>
<td>• Symptom: Diplopia</td>
</tr>
<tr>
<td>• Ass sym: headache</td>
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<tr>
<td>• Other neurological signs present</td>
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<tr>
<td>• Head posture: present</td>
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<tr>
<td>• Cyclotropia: present</td>
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<tr>
<td>• Past pointing: present</td>
</tr>
<tr>
<td>• Sensory adaptation: absent</td>
</tr>
<tr>
<td>• Gradual</td>
</tr>
<tr>
<td>• Absent</td>
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<tr>
<td>• Pediatric</td>
</tr>
<tr>
<td>• Usually no diplopia</td>
</tr>
<tr>
<td>• No headache</td>
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<tr>
<td>• Absent</td>
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<tr>
<td>• Absent</td>
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<tr>
<td>• No</td>
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<tr>
<td>• No</td>
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<tr>
<td>• Present</td>
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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, diptheria, alcohol, lead
- Demyelination; MS
- Myaesthenia Gravis
Work up

- Examination for cause
- Blood investigations, CT scan
- Tensilon test for MG
- Diplopia charting
- Lees Charting
- FDT
- Management: cause, prisms, patching, surgery
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 4\textsuperscript{TH} 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
Congenital Motor Nystagmus
Muscle surgeries

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