Diplopia in children

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diplopia in children is rare

- Critical period of visual development
  - Visual acuity
  - Binocular vision

- Sensory adaptation:
  - Pathologic suppression and ARC develop only in the immature visual system
Symptoms of diplopia in children

- Torticollis
- Rubbing in one eye
- Closing one eye
- “I see two daddies”
Conditions for binocular single vision

- Simultaneous use of both eyes with bifoveal fixation
- Normal routing of visual pathways with overlapping visual fields
- Binocularly driven neurons in the visual cortex
- Normal retinal correspondence
Conditions for Binocular Single Vision

- Accurate neuromuscular development so that visual axes are directed at and maintain the fixation on the object of regard
- Approximately equal image clarity and size for both eyes
Development of binocular vision

- Bifoveal fixation

- Fusion of 2 retinal images into a single image in the mind
  - Sensory fusion: Corresponding retinal points project to the same cortical locus where the input is integrated into one image
  - Motorfusion: maintenance of motor alignment of the eyes to sustain bifoveal fixation. (driven by retinal disparity)
Development of binocular vision

- **Stereopsis**:  
  → Stereopsis is bridge between fusion and diplopia

Retinal disparity is too great to permit simple superposition of the two visual directions but too small to elicit diplopia.
Binocular Single Vision

- Each fovea fixates identical point
- Corresponding retinal points horopter
- 3-dimensional space: Panum’s area
Manifest deviation of the eyes

- **Diplopia:**
  - Image on the fovea in one eye and a nonfoveal corresponding point in the other eye of one object

- **Confusion:**
  - Perception of two different objects on corresponding retinal points
Sensory adaptations to strabismus

- **Suppression**: 
  - The image of one eye is inhibited to reach consciousness during binocular activity 
  - Central suppression (fovea): confusion 
  - Peripheral suppression: diplopia

- **Amblyopia**: with constant unilateral foveal suppression of one eye 
  - non alternating strabismus
Sensory adaptations to strabismus

- **Abnormal Retinal Correspondence**
  - Condition where the fovea of the fixating eye has acquired an anomalous common visual direction with a non-foveal point in the deviated eye
  - Allows some binocular vision in the presence of heterotropia
Case report 1

- Girl 7 y
- Intermittent diplopia since one week
- General history: excellent school results, no complaints, normal activity
- Anxious because of double sight
- Ophtalmological and orthoptic examination: perfectly normal
- Diagnosis: physiological diplopia
Physiological diplopia

- Occurrence depends on the attention paid to double images
- Normally retinal rivalry prevents image to reach the conscious mind (physiologic suppression)
- Double vision: outside Panum’s area
- Fingertest
Case report 2 Boy 4 y

- Sudden convergent squint, closing one eye
- Positive history in family for strabismus and hypermetropia
- Visual acuity: 0.4 logMar both eyes
- CT: esotropia OD, can alternate fixation
- M: RF=LF: +18° Syn: RF=LF: +21°
- No motility restrictions or incommitance
- Convergence normal
- Cycloplegic refraction +5.5 ODS
Optical treatment

- Full correction +5.5 ODS
- Alternating occlusion until optic correction available
- One week later cc esophoria, Lang –
- After 7 months correction: recurrent diplopia
- Stronger glasses +6.5 ODS
- Continues to close one eye with full correction, mentions diplopia
Surgery:
5 mm recession of both medial recti

- No diplopia
- Does not want to wear correction
- Visual acuity:
  - OD : 0,9 sc
  - OS : 0,7 sc
- Bagolini test : BSV-ARC
- CT : no movement to microexotropia ?
- Stereoscopy : 400” titmus test
conclusion

- Acute concomitant strabismus with diplopia
- Latent hypermetropia
- Probably underlying ARC
- Recovered after surgery
- Careful follow up and occlusion left eye 1h/day
Case report 3

- Girl 15 y
  - Aggression in the metro
  - Hospitalisation with retrograde amnesia and mutism
  - Alternating esotropia, with diplopia and photophobia, dilated pupils (medical)
  - No motility restriction
  - Eyefundus normal
Ophthalmological work-up 2 days later

- Known latent hypermetropia : + 4
- Partial correction at home
- Treatment : optical correction
- Net regression of diplopia, and no diplopia after 2 days
- Controle 6 months later : no complaints , no correction anymore
Stress on visual system with accommodative anomaly

- Rupture of sensory fusion secondary to stress
- Diplopia
- Relief of “overaccommodation” with partial correction
- Normalisation of fusion
Girl 6 years

- Deep amblyopia OS secondary to partial congenital cataract and microdivergent strabismus
- Operated and pseudophake: with optimal correction 0.2
- Excentric fixation
treatment

- Optical correction with addition for near
- Total occlusion during 3.5 months: visual acuity of 0.4
- During 6 months occlusion 8-18h: 0.5
- Reduction of occlusion since complaints of diplopia

- Cave intractable diplopia
Conclusion

- Physiological diplopia
- Sudden concomitant strabismus
- Disruption of fusion by accommodative spasm
- Diplopia after occlusion treatment