A Clinical Approach to Diplopia

Konrad P. Weber
Interdisciplinary Center for Vertigo and Neurological Visual Disorders
University Hospital Zurich
EAN Spring School 2018
Stare Sipavy, 12 May 2018

The Very First Question

Is the double vision monocular or binocular?

The Pinhole Test

Monocular Diplopia
Refractive until proven otherwise!

- Refractive media
  - Refractive error
  - Cornea
  - Cataract
  - Iris defect
  - Dislocated lens
- Central polyopia (exceptionally rare)
- Functional

Evaluation of Binocular Diplopia

- History
- Range of eye movements
- Ocular alignment
- Other neuro-ophthalmological findings

History

- Are the two images separated horizontally, vertically, or torsionally?
- Does the image separation change as gaze position changes?
- Has the image separation changed over time?
When Does Strabismus NOT cause Diplopia?

- Poor visual acuity
- Amblyopia
- Suppression
- Visual field defects
- Very small misalignment
- Very large misalignment
- Poor cognition
- Poor communication

Strabismus Terminology

- Heterotropia
  - Exotropia, Esotropia
  - Manifest Strabismus
- Heterophoria
  - Exophoria, Esotropia
  - Latent Strabismus
- Concomitant strabismus
  - Nonparetic strabismus
- Incomitant strabismus
  - Oculomotor palsy
  - Trochlear palsy
  - Abducens palsy
  - Paretic strabismus

Testing the Range of Eye Movements

6 Cardinal Directions of Gaze

Deviation increases in pulling direction of the affected muscle.

Clinical Examination of Binocular Diplopia

Objective:
- Corneal Reflection
- Cover-Test

Subjective:
- Disappearing image test
- Maddox-Rod
- Must see the target
- Able to pick up fixation
- No image suppression
- Good communication

Corneal Reflection (Hirschberg Test)

15°
30°
45°

1 mm = 12°

Cover Test

- Observe the non-covered eye
- Eso- oder exotropia
- Gaze at distance and near
Uncover Test

• Observe the previously covered eye
• Eso- oder Exophoria

Alternate Cover Test

• Heterophoria + Heterotropia

Congenital Left Trochlear Nerve Palsy

Parks 3-Step Test for Vertical Misalignment

1. Which eye is higher?

2. Does the misalignment increase on left or right gaze?

3. Bielschowsky Head Tilt Test
Parks Test 4th Step  
upright - supine

- Decrease of vertical deviation > 50% upright – supine
  -> skew deviation

Parulekar MV et al. 2008

Vertical Change Index (VCI)

Crossed eyes cause uncrossed double vision

Uncrossed eyes cause crossed double vision

Maddox-Rod

Horizontal

Vertical

Trobe JD, Medlink Neurology 2008.

Adjustable Maddox Prism

Esophoria
Exophoria

The tip of the prism points to the phoria!

Double-Maddox

Torsional

Trobe JD, Medlink Neurology 2008.
Hess-Screen

subjective

Right Oculomotor Palsy
with Right Ptosis and Mydriasis

deviation of
the right eye
deviation of
the left eye

The smaller box
has the pathology

Mucocele of the Sphenoid Sinus

Therapy
Bilateral sphenoidotomy with
drainage of the mucocele

Hess-Screen
follow-up 40 days post-operative

55-year-old woman
Lesion Affecting the Abducens Nerve at Dorello’s Canal

Right Trochlear Nerve Palsy

Deviation of the left eye

Deviation of the right eye

Bielschowsky-Test

Strabismus Video Goggles

• Binocular eye movement tracking with infrared video cameras
• Integrated LCD shutters for alternate eye occlusion
• Head-mounted laser target projection
• Fast self-calibrating paradigm (~2 minutes)
• Prototype weight ~100g


It’s all about pattern recognition!

81-year-old woman

History

• One evening, she noticed a droopy eyelid...accompanied by headaches...took some aspirine.

• Consulted the GP the next morning: noticed anisocoria le>re, double vision.
History II (from GP!)

- Acute subarachnoid hemorrhage 1989
  - Ruptured aneurysm of the left middle cerebral artery (MCA) bifurcation
  - 1989 craniotomy, clipping of left MCA bifurcation aneurysm
  - 1990 craniotomy, clipping right MCA aneurysm

CT scan

CT-Angiography

Posterior communicating artery (PCOM) aneurysm

Posterior Communicating Artery Aneurysm

Posterior Communicating Artery Aneurysm
Therapy

• Coiling of the PCOM aneurysm
• Complicated course:
  Hydrocephalus, VP shunt implantation
  myocardial infarction, peritonitis (PEG tube), C. difficile

Outcome

• 1 month rehab
• Discharged to nursing home
• Right sensorimotor hemisindrome, aphasia

Teaching Points

• Acute third nerve palsy is one of the most dangerous
  neuro-ophthalmological emergencies.
• Don’t be reassured by a pupil-sparing palsy.
• Patients need URGENT CT or MR angiography.
• Images have to be reviewed by an expert neuroradiologist asking the specific question about
  PCOM aneurysm.

23-year-old man

History

• Horizontal double vision, initially only on gaze to the left, now to both sides.

Video

Bilateral INO – straight ahead

Underdiagnosis of Posterior Communicating Artery Aneurysm in Noninvasive Brain Vascular Studies
Valerie I. Elmaleh, MD, Patricia A. Hodge, MD, Beau B. Bruce, MD,
Nancy J. Kesten, MD, Valerie Broude, MD

• 417 patients with III palsy, aneurysm or SAH
• 17 patients with acute, isolated painful III palsy
• 8 missed PCOM aneurysms
  – All from outside institutions
  – All scans of sufficient quality
  – All PCOM aneurysms easily identifiable

➤ Absence of neuroradiology training
➤ Vague or incorrect clinical history
Internuclear Ophthalmoplegia (INO)

- Relapsing remitting multiple sclerosis
- Methylprednisone 1g/d for 5 days
  - Marked improvement
- Started on glatiramer acetate

Horizontal Saccades

Vertical Vestibulo-Ocular Reflex

Teaching Points

Etiology
- 34% Multiple Sclerosis
  - often bilateral, < 45y
- 38% Infarction
  - unilateral, > 60y
- 28% Other

Differential diagnosis
- Third nerve palsy
- Myasthenia gravis
- Miller-Fisher syndrome
- Restrictive strabismus

Symptoms
- Diplopia
- Oscillopsia
- Blurred vision
- Dizziness

Signs
- Adduction deficit (ipsilateral)
  - Adduction lag
  - Postsaccadic drift
- Dissociated nystagmus (contralateral)
- Preserved convergence
- Skew deviation (affected eye higher)

Internuclear Ophthalmoplegia
Seek and you shall find!
31-year-old woman
7 months post partum

MRI

Hess Screen

Edrophonium Test

Diagnosis: Pseudo INO from Myasthenia gravis

• Stage Ossermann IIa
  – Slight, fluctuating generalized muscle fatigue

• Positive anti-Acetylcholine receptor-Ab (73.8 nmol/l)
• Negative Anti-MuSK, negative anti-Titin
• Normal thyroid function

• Therapy: Pyridostigmine 4x30mg


Six Months Later
without any medication
Clinical Features

- 50% of patients present with ptosis or diplopia
- 50% of patients 'generalize', typically within 1 year (older patients at greater risk)
- If different doctors make different diagnoses, think about myasthenia!

Myasthenia in pregnancy

- Relapses most frequent during first trimester or post partum
  - 41% Deterioration
  - 29% Improvement
  - 30% No change
- Post partum relapses
  - Post partum infections
  - Post-operative (C-section)

References


Thank you for your attention!