AN APPROACH TO DIFFERENT OCULAR MOTILITY DISORDERS

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Disclosure

• None related to the teaching course
Need for eye movements

• Eye movements serve to compensate for constraints of organisation of the visual system
  • 1rst constraint: binocular frontal vision ➔ need to align the eye axis and move the eye together
  • 2nd constraint: development of foveal vision (tubular) ➔ need to make rapid eye movements for multiple fixation
    • Saccades, vergence
  • 3rd constraint: need for retinal stability during period of fixations ➔ (slow) stabilisation eye movements
    • Fixation
    • Smooth pursuit (SP)
    • Vestibulo-ocular reflex (VOR)
Ocular motor disorders

• Peripheral ocular motor palsy and *diplopia*
• Central ocular motor palsy and *gaze palsy*
• Deficit of ocular stability: nystagmus, saccadic intrusions and *oscillopsia*
• Deficit in slow eye movements (asymptomatic)
Learning objectives

• Revisit the peripheral and central organisation of eye movements
• Steps of ocular motor examination in case of diplopia
• How to examine central ocular motor deficit
• Which type of different ocular motor instability can be observed
• How to examine asymptomatic slow eye movements
Key messages

- In case of diplopia
  - Search for the involved muscle
  - Test version and vergence in case of adduction palsy

- In case of gaze palsy
  - Check rapid (saccades) and slow (Smooth Pursuit, Oculocephalic reflex) eye movements

- In case of oscillopsia
  - Check ocular fixation and head impulse test

- Don’t forget Oculocephalic reflex inhibition
  - in systematic examination of slow eye movements
Plan

• Some basic knowledge
• Diplopia and peripheral ocular motor deficit
• Gaze palsy and central ocular motor deficit
• Oscillopsia and nystagmus / other abnormal eye movements
Ocular muscles

Superior oblique
Medial rectus
Superior rectus
Inferior rectus
Lateral rectus
Inferior oblique
Ocular motor nerves

Vignal, Tilikete, Miléa 2016
Central pathways
Central pathways

Slow eye mvts

Saccades

Adduction

Abduction

Medial rectus

Lateral rectus

Medial longitudinal fasciculus

Pons

Abducens nucleus

Vestibular nuclei

Mesiencyphalon

VIth nerve

IIIrd nerve

Interneuron

Abducens nucleus

Pontine Paramedian Reticular Formation
1. Diplopia: which involved muscle(s)?

• 1\textsuperscript{st} step:
  • observation of manifest ocular deviation (or strabismus) in primary position of gaze
  • assessing the amplitude of ductions and versions

Stop here if obvious strabismus and limitation
If important limitation: forced duction test (mechanical restriction)
1. Diplopia: which involved muscle(s)

Next steps detect relative ocular deviations (but not the paretic eye)

2nd step: test heterotropia by using the cover-uncover test (manifest ocular deviation)

Stop here if obvious heterotropia
1. Diplopia: which involved muscle(s)

3rd step: in case of orthotropia, test heterophoria by using the cross cover test (latent ocular deviation)
1. Diplopia: Adduction palsy: peripheral or central (INO)?

- test adduction in version and vergence
- test slow and rapid eye movements
1. Diplopia: Localize the lesion

- Muscle
- Neuro-muscular junction
- Nerve
- Central
- Congenital
- Functional
2. Gaze palsy: peripheral or central?

Test slow and rapid eye movements

Saccades  Smooth Pursuit  Oculo-cephalic reflex

Convergence
2. Gaze palsy: peripheral or central?

Abducens nucleus syndrome
2. Gaze palsy: peripheral or central?

Supranuclear horizontal palsy
2. Gaze palsy: peripheral or central?

• Supranuclear vertical palsy
3. Spontaneous oscillopsia: ocular instability?

NYSTAGMUS

• Regular to and fro movement of the eye, initiated by a slow phase

[Diagram of Jerk nystagmus]

[Diagram of Pendular nystagmus]
3. Spontaneous oscillopsia: ocular instability?

Jerk or pendular nystagmus?
3. Spontaneous oscillopsia: ocular instability?

SACCADIC INTRUSION

• With intersaccadic latency (200 msec)
  • Square waves
  • Macro square waves
  • Macrosaccadic oscillations
  • Saccadic pulse
3. Spontaneous oscillopsia: ocular instability?

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SACCADIC INTRUSION

• Without intersaccadic latency
  
  • Flutter

• Opsoclonus
3. Oscillopsia during head movements: VOR deficit?

test VOR during head impulse test
4. Systematic slow eye movement examination

test oculocephalic reflex, smooth pursuit, and OCR inhibition
References

• Leigh & Zee. The neurology of Eye Movement. 5ed. New Yord: Oxford University Press. 2015
