VI nerve palsy
Clinical Approach and Treatment in adult population

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Anatomy of nervus VI

- **Nucleus**
  - caudal portion of pontine tegmentum beneath floor 4th ventricle
  - n VII fibers loop around VI
  - MLF passes medial of VI
- **Medial longitudinal fasciculus**
  (conjugate horizontal gaze)
Basilar: ventral face of the pons pierces dura of the clivus, runs beneath the petroclinoid ligament

Sinus Cavernosus: VI lies freely within the body

Orbita: superior orbital fissure
Etiology VI palsy

All lesions on the path of the long tortuous course of the VI (intracerebral to intraorbital)

- Neoplasm, infection, trauma, neurologic disorders, …
- Vasculopathies frequently > 50 y
- Isolated VI or multiple cranial nerve palsies
VI and intracranial pressure

- Downward movement of the brain stem
- As the VI ascends the clivus in the subarachnoid space it is vulnerable
- Uni or bilateral VI
- Causes: neoplasms, insults, infection, trauma, benign ICH
- Symptoms: headache, nausea, vomit, papiledema, visual disturbance
VI and VII, VIII, V

- VII: facial palsy
- V: cornea hypoesthesia, facial paresthesias, eye or facial pain
- VIII: loss of hearing, deafness, vestibular symptoms
VI and apex petrosus syndrome (= Gradenigo syndrome)

- Involvement of VI in combination with:
  - VII (facial palsy)
  - V (facial or eye pain)
  - VIII (loss of hearing)
- Cause: inflammation of the petrous bone secondary to middle-ear infections
VI with V, VII and VIII

- Other causes
  - Acusticus neurinoma
  - Meningioma
  - Nasopharyngeal tumor: proliferation through basal foramina (nosebleeding, nose obstruction)
VI and aneurysma a. carotis interna intracavernous

- VI lies central in the sinus cavernosus, not in the wall
- Combination with ipsilateral Horner
- Slow progressive unilateral ophthalmoplegia
- May become painful
- May rupture (fistel, rarely subarachnoidal bleeding)
VI and carotid-cavernous fistulas

- Spontaneous dural shunts
- Frequently in elderly people
- VI parese, sometimes painful, ocular tension, red eye, tortuous blood vessels, proptosis, postauricular noise
- Sometimes spontaneous recovery
Cavernous sinus thrombosis

- VI may be the first sign
- III (ptose), IV, V ophtalmic trigeminus (pain)
- Horner
Cavernous sinus thrombosis

- Etiologie:
  - 70% neoplasm
  - vascular (aneurysma, fistulas)
  - inflammation (infectieus, non-infectieus = Tolosa-Hunt)
  - trauma
Isolated VI nerve palsy

- Peripheral microvascular ischemic lesion (vasa nervorum)
- Vascular risk factors (diabetes, hypertension, cholesterol)
- Acute palsy (in 7-10 days)
- No other neurological signs 1 month before and 4 months after onset
- Sometimes pain
- Recovery within 3-6 months
Clinical characteristics

- Complaint of horizontal diplopia
  far > near
- Esotropia (incomitant)
- Limitation of abduction
- Compensatory face turn if meaningful field of binocular single vision
Clinical examination

- Objective: CT, ACT
- Subjective:
  - maddox rod: even small incomitances will be seen
  - Hess Lancaster
Hess - Lancaster
Paresis versus complete palsy

Observation of abduction:
Abduction past midline = paresis
no abduction past midline : due to either
tight MR or true LR palsy
( in longstanding VI )
forced duction test to evaluate muscle function
Differential Diagnosis of abduction deficits

- Graves’ myopathy
- Myasthenia gravis (tensilontest)
- Orbital pseudotumor myositis
- Orbital trauma (medial rectus entrapment)
- Congenital defects (Duane)
Workup VI palsy

Exclude hypertension

Blood studies:
- diabetes
- lipids
- older than 55y: giant cell arteritis
  (erythrocyte sedimentation rate)
Workup VI palsy

Radiologic investigation: CT, MRI, cerebral angiography

- Bilateral or multiple oculomotor paresis
- Other neurological signs (papiledema, nystagmus, hemiparesis)
- Isolated paresis:
  - observation monthly
  - if no recovery in 3 - 4 months
Recovery

- Spontaneous recovery depends on its cause.
- Majority of isolated vascular VI palsy recover within 6 months.
- Recurrences may occur, usually on the same side.
Treatment: nonsurgical

Patching

- Occlusion of the good eye may lead to disorientation and vertigo
- Sectorocclusion: nasal part of the good eye or temporal part of the paretic eye
Treatment: nonsurgical

Fresnel add-on prisms

- Only for small deviations < 15°
- Only if incomitances are small
- Best in front of the paretic eye (secondary deviations)
Treatment: nonsurgical

Botulinum toxin injection in MR

- decision will depend on the degree of palsy
- Partial VI with area of binocular vision: no botulinum
- Complete VI: some will use botulinum within two weeks, other if no signs of improvement within a month
Study of botulinum toxin in acute unilateral VI palsy

( graefes arch clin exp ophthalmol)

70% of patients who refused injection
10% of patients received botulinum required surgery

Other studies showed no evidence of any difference in outcome between treated and untreated group

Disadvantage of botulinum: crossed diplopia in contralateral gaze, ptose, temporary contraction of the binocular single vision field
Treatment: Surgical

- Six months delay
- Good preoperative evaluation of the abduction, the incomitances, forced duction test
- Aim: correction of esodeviation, improvement of abduction, increase of size of the diplopia free binocular field
Treatment: Surgical

After **recovery of the paresis** only an esotropia can persist

- Hess Lancaster: concomitant
- **Recession of both MR**
Treatment: Surgical

Partial paresis remains

- Hess-Lancaster: incomitance
- Abduction past the midline
- Forced duction perop: MR contracture

Recession-resection of the horizontal muscles
Treatment: Surgical

Complete VI palsy

- Not done: Recession of the MR and resection of LR may have a transient mechanical result but a poor long-term alignment

Transposition of the vertical muscles with MR weakening

- Paretic muscle remains undisturbed to preserve blood supply to anterior segment
Transposition SR and IR and recession MR

- Improves the abduction postop
- Risk of anterior segment ischemia if 3 recti are operated in the same time
- Jensen procedure (muscle union) or a partial muscle transposition procedure may give undercorrection
- Sparing of the anterior ciliary vessels may be difficult because of the long distance of the transposition
Transposition SR and IR and recession MR

- At UZ Leuven we start with a recession MR and botulinum injection.
- When the botulinum is worked out after a few weeks we do the full transposition SR and IR and repeat the botulinum if we observe again a MR contracture.
Undercorrection

- Often when rec-res is performed when there was a complete VI palsy
- After transposition: reinjection of botulinum
  or recession of the contralateral MR
Overcorrection

- Rare
- After Jenson procedure: difficult to repair
- Slipped MR
Induced vertical deviation

- Induced by the surgery
- Perop: take care of freeing the muscles: SR from superior oblique, IR from the capsulopalpebral attachments
- Some surgeons will reduce the incidence by placing SR and IR on adjustables
- Always be aware of an associated fourth nerve palsy or skew deviation
Conclusion

- Anamnesis (cardiovascular, neurological problems, malignance)
- Check other cranial nerves
- Observe monthly
- Appropriate surgical strategy after stabilisation (6 months)