VI nerve palsy
Clinical Approach and Treatment
in adult population

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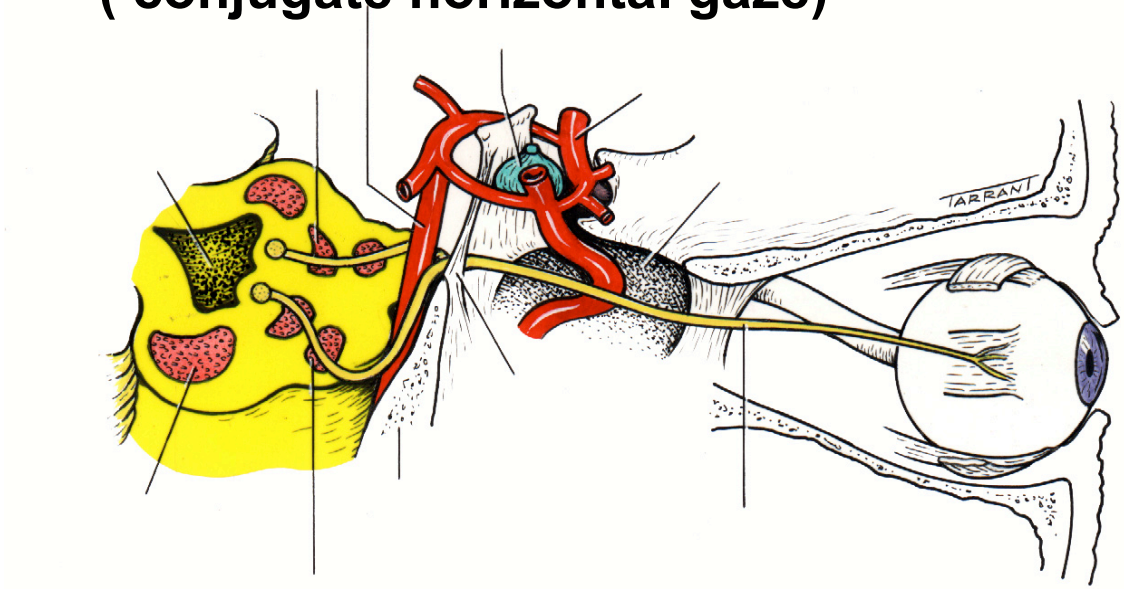
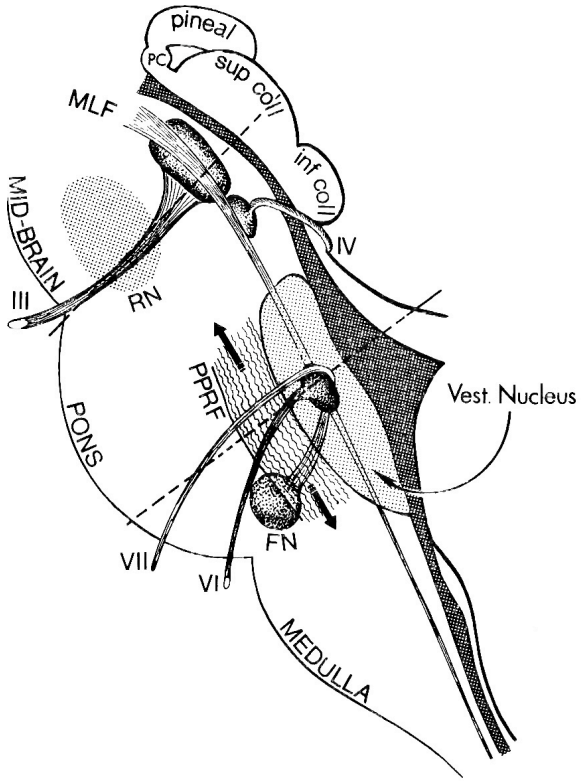
Anatomy of nervus VI

- **Nucleus**
  - caudal portion of pontine tegmentum beneath floor 4th ventricle

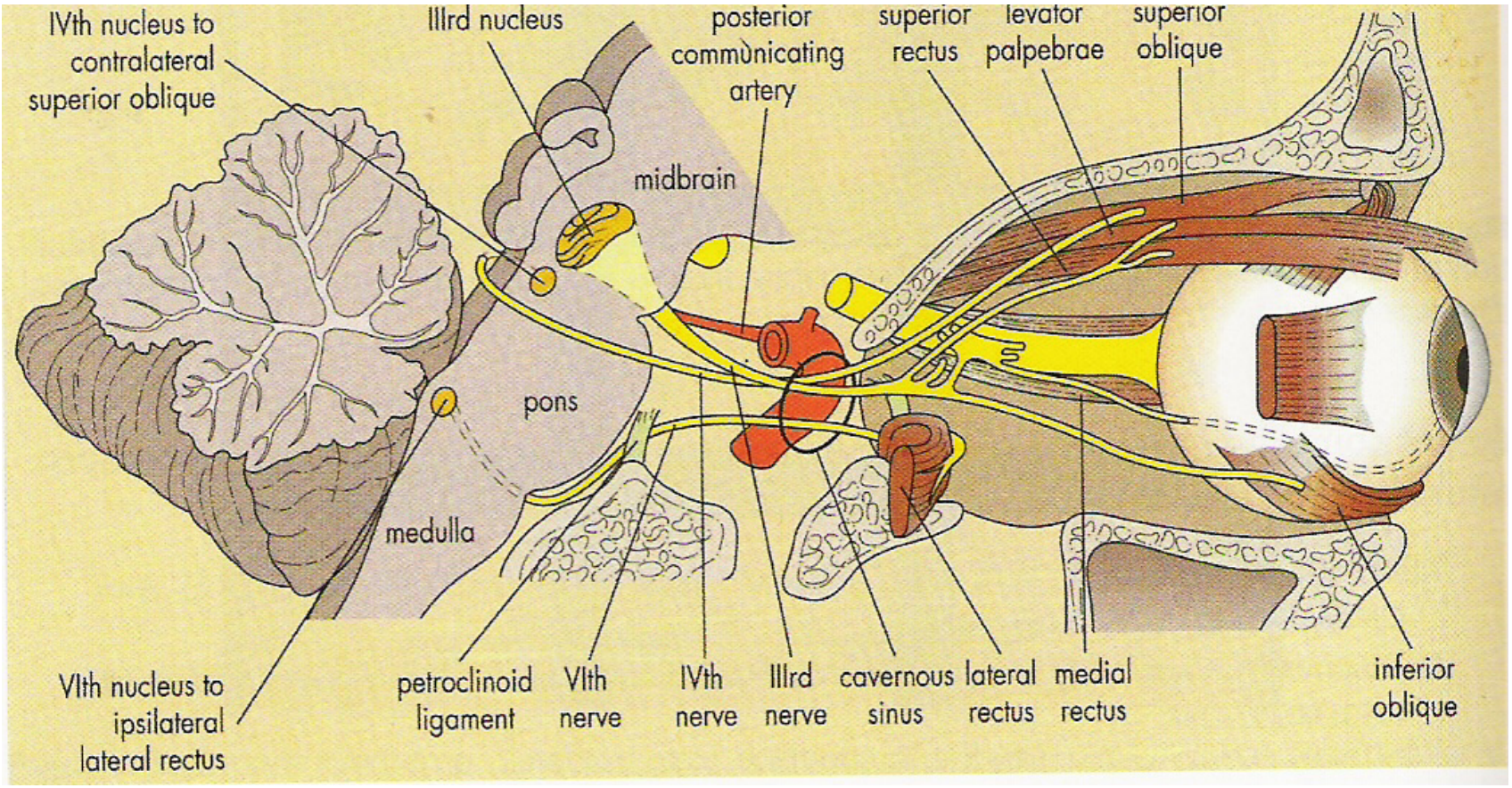
    n VII fibers loop around VI

    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)

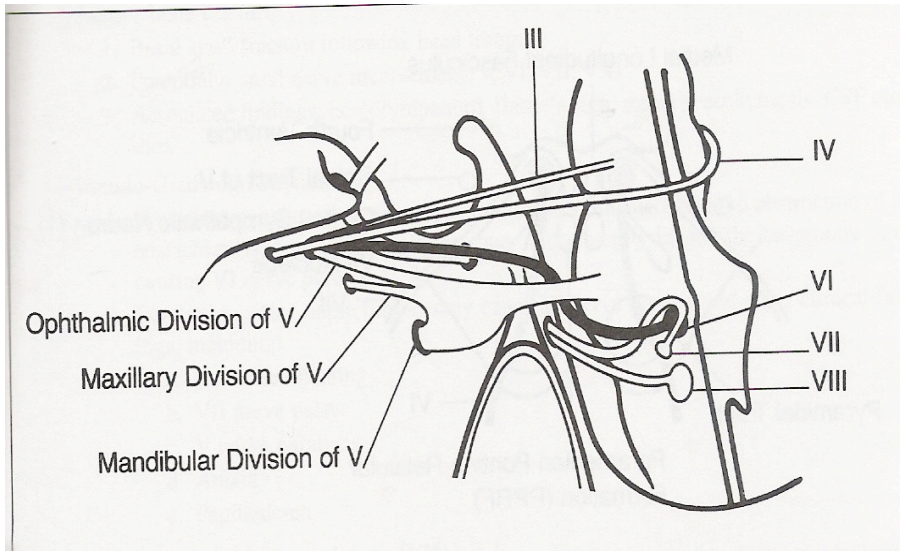
- Neoplasm, infection, trauma, neurologic disorders, …
- Vasculopathies frequently > 50 y
- Isolated VI or multiple cranial nerve palsies

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 secundary 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

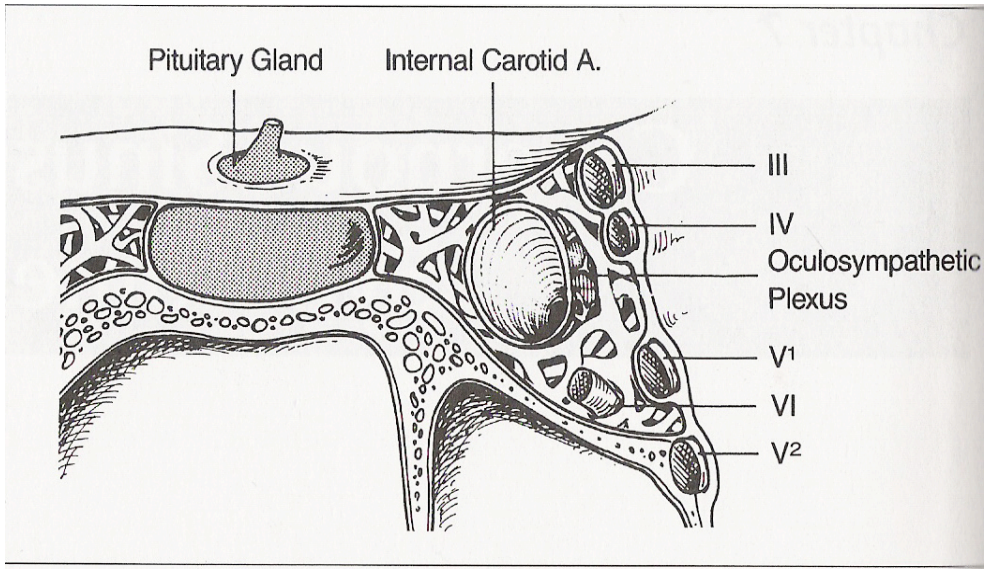
- VI lies central in the sinus cavernosus , not in the wall
- Combination with ipsilateral Horner
- Slow progressive unilateral ophthalmoplegia
- May become painful
- May rupture (fistel, rarely subarachnoidal bleeding)

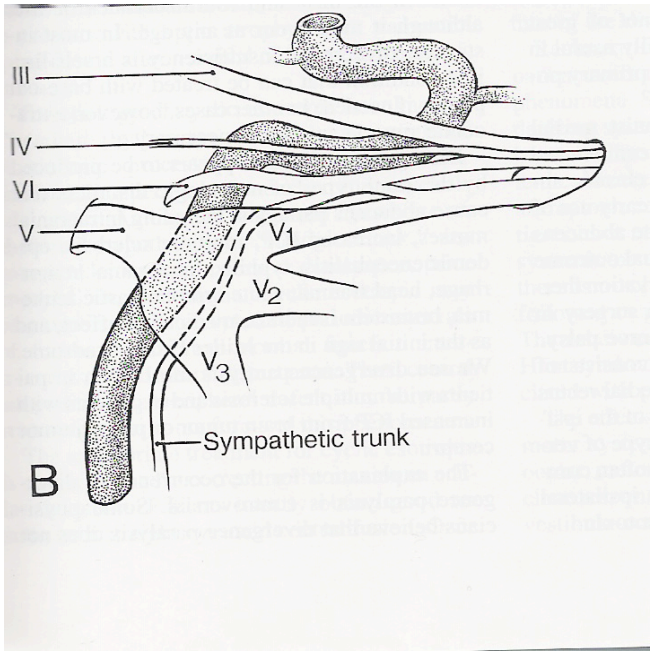
VI and carotid-cavernous fistulas

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

Cavernous sinus thrombosis

- VI may be the first sign
- III (ptose) ,IV , V1ophtalmic 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

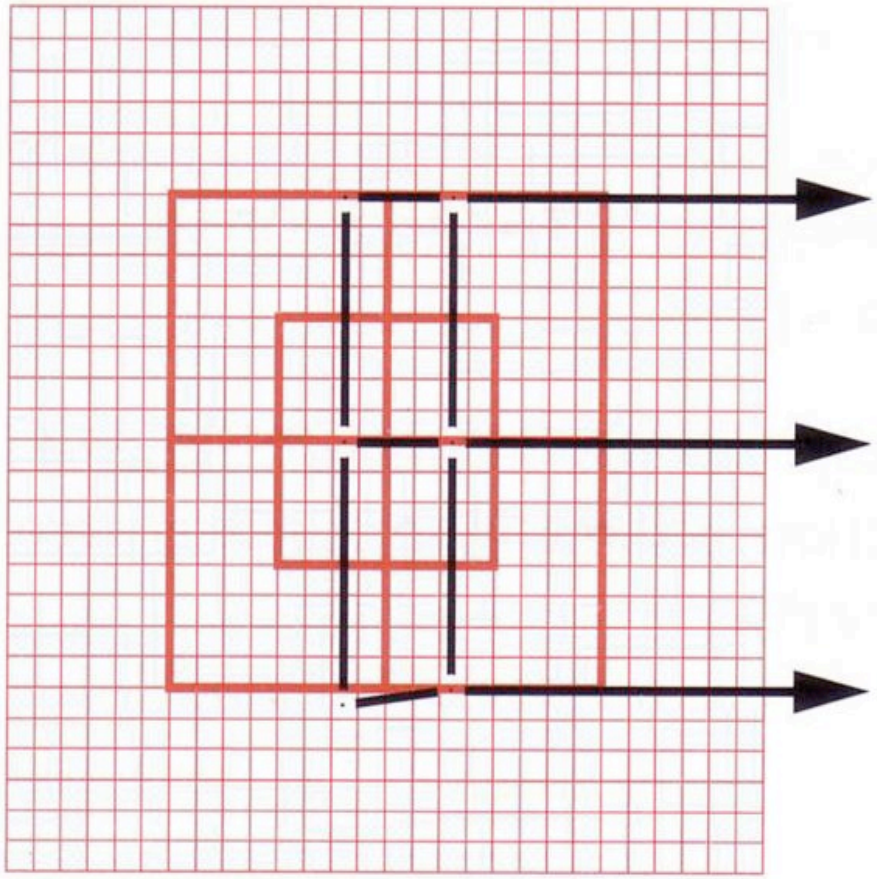
Clinical examination

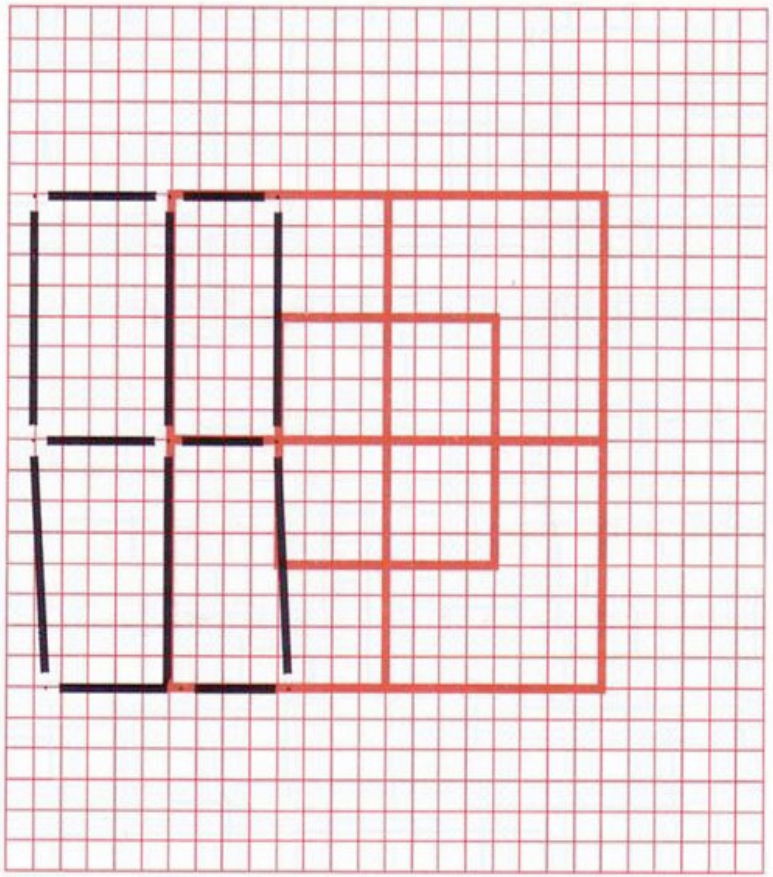
- Objective: CT, ACT
- Subjective:

  - maddox rod :even small incomitances will be seen

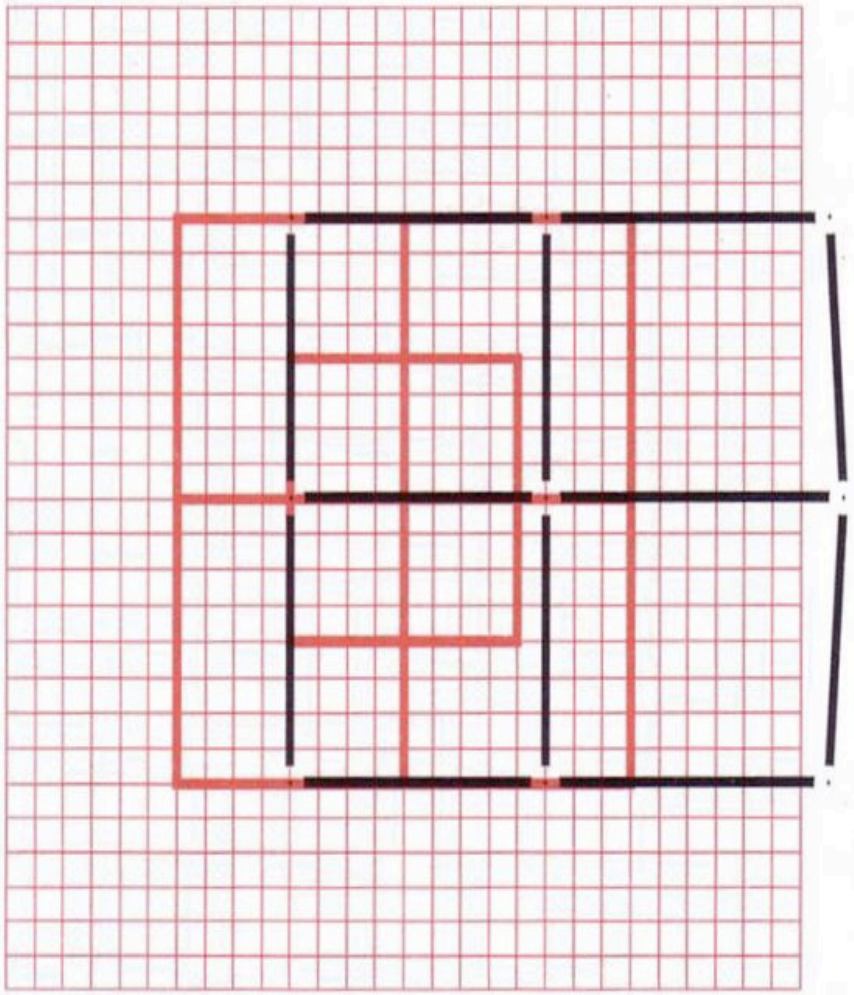
  - Hess Lancaster

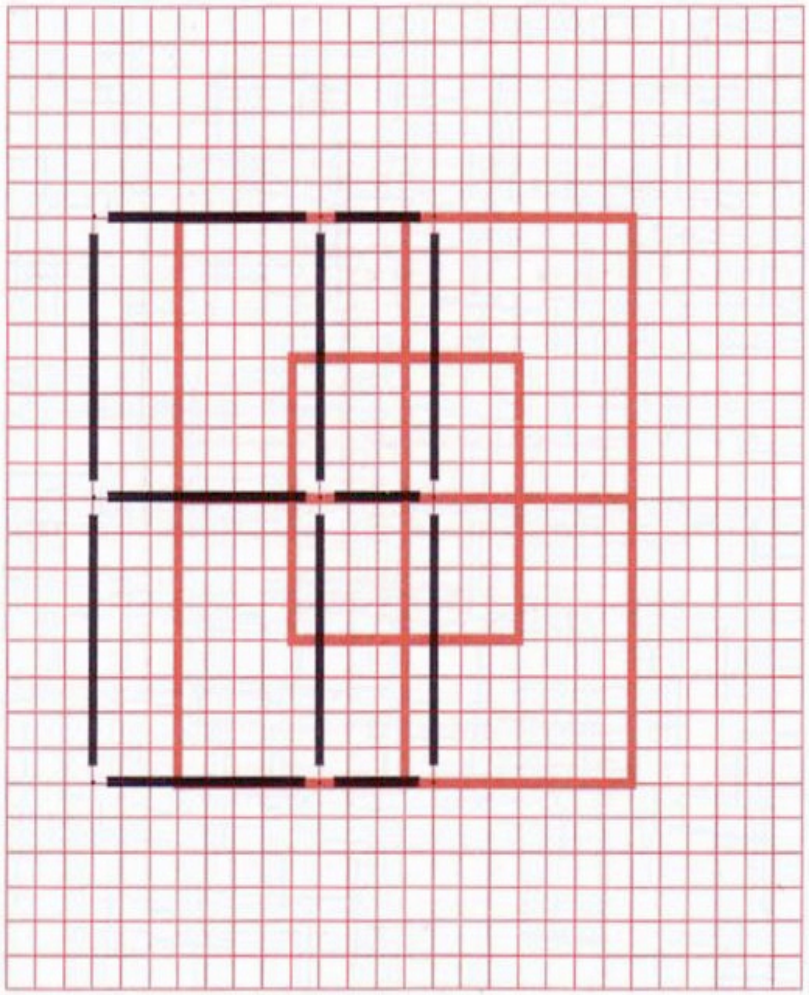
Hess - Lancaster





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 vison: 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 arc 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

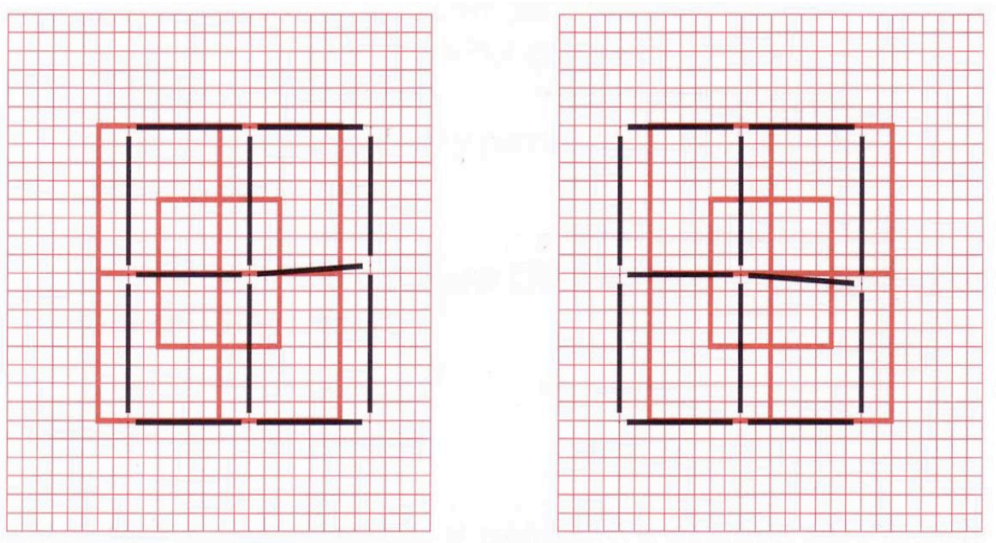
Treatment : Surgical

- 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

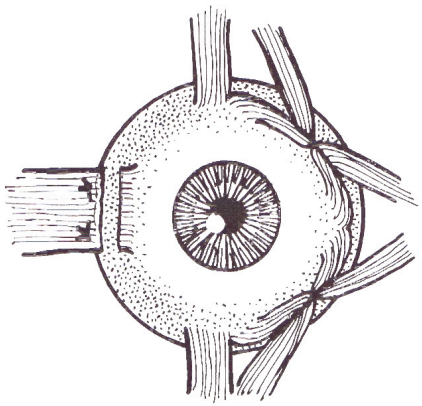
- Not done: Recession of the MR and resection of LR may have a transient mechanical result but a poor long-term alignment

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
- Appropiate surgical strategy after stabilisation (6 months)