Pathophysiology of the brain stem

Brain stem

- Medulla oblongata
- Pons Varoli
- Mesencephalon

Border of the medulla oblongata and spinal cord:

- Crossing of the corticospinal tract at the level of the foramen occipitale magnum

Grey matter of the brainstem

- 6 rows of cranial nerve nuclei
- Reconnection caters of the optic and auditory tracts localized in pairs in the mesencephalon (colliculi superiores, inferiores), centers of unconditioned visual and auditory reflexes
- Reticular formation

White matter of the brain stem

- **Descendant pathways**: - tr. corticospinalis
  - tr. corticonuclearis
  - tr. rubrospinalis
  - tr. tectospinalis
  - tr. vestibulospinalis
  - tr. corticopontinus

- **Ascendant pathways**: - tr. spinothalamicus
  - tr. bulbothalamicus
  - lemniscus lateralis
  - tr. spinocerebellaris
  - brachia conjunctiva

Focal lesions of the brain stem

- Bulbar paralysis
- Pseudobulbar syndrome
- Alternating syndromes
- „Encéphale isolé“ syndrome
- „Cerveau isolé“ syndrome

Bulbar paralysis

- Bilateral affection of the brain stem including vegetative centers
- Connected with motor disorders of the cranial nerves of the caudal group (IX. – XII.) – lesions of the nuclei or nerves – peripheral palsy
- Manifestations: dyspnea, dysphagia, hoarse voice, atrophy of the tongue, missing emetic reflex, tachycardia, arrhythmia, disorders of mastication and salivation, respiration and circulation arrest lead to death
- Often consequence of intracranial hypertension – occipital conus!

Pseudobulbar syndrome

- Lesions localized higher, supranuclear lesions (bilateral lesion of the tr. corticonuclearis)
- Central palsy of motor cranial nerves without atrophy
- Similar signs, but not atrophy (tongue), increased masseter reflex
- The disorders must be bilateral!

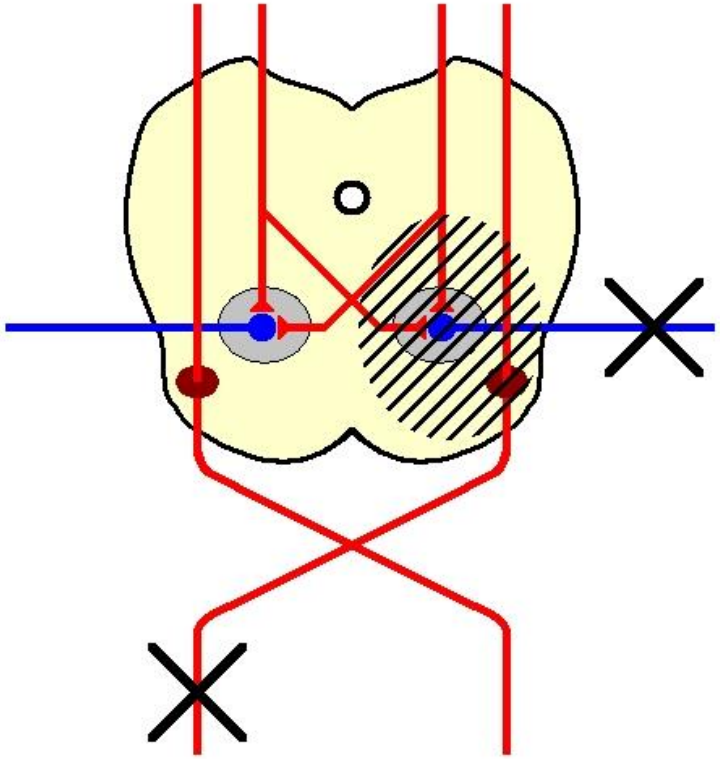
Alternating syndromes

- Unilateral lesion of the brain stem with affection of the tr. corticospinalis and some of the cranial nerves or its nucleus
- **Contralateral** hemiparesis or hemiplegia with sensitivity disorder, **ipsilateral** peripheral palsy in appropriate innervation area
- Several syndromes with symptoms depending on affection of particular cranial nerve nuclei

Examples:

- **Jackson's syndrome** (hemiplegia alternans inferior): peripheral palsy of the n. hypoglossus (XII.) and contralateral central hemiplegia
- **Weber's syndrome** (hemiplegia alternans superior): lesion in the mesencephalon, affection of the n. III, ipsilateral mydriasis, photoreaction disorder, ptosis, divergent strabismus, contralateral central hemiplegia

Alternating syndromes



central motoneuron

peripheral motoneuron

Transversal lesion of the brain stem

- **Encéphale isolé**: interruption between the spinal cord and medulla oblongata at the level of C1 and C2
  - The brain remains intact.
  - Necessity of artificial ventilation
  - Reaction to visual, auditory and skin stimuli from the head area
  - Movements of eye balls and tongue
  - Sleep-awake cycle (RAS preserved)

- **Cerveau isolé**: lesion in the mesencephalon between the colliculi superiores and inferiores
  - The telencephalon is separated from all afforestations.
  - Spontaneous ventilation is preserved!
  - The brain does not react to any stimuli
  - EEG shows sleep activity
  - Decerebration rigidity