Where is the lesion?
Neuroanatomical Localization

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CLINICAL APPROACH

• PHYSICAL EXAMINATION
• NEUROLOGICAL EXAM
• NEUROANATOMICAL LOCALIZATION
• ANCILLARY DIAGNOSTIC AIDS
• THERAPY

To achieve a Neuroanatomical localization is essential to perform a rational “step by step” approach
Avoid “short cuts”, that disregard the proper neurological work-up

UPPER MOTOR NEURON (UMN)

- It’s the “motor system”, limited to SNC, responsible for voluntary movement, muscle tone control and posture.

(corticospinal, rubrospinal, reticulospinal, vestibulospinal tracts)
UPPER MOTOR NEURON

LOWER MOTOR NEURON (LMN)

- It's the efferent neuron that put in connection the CNS with muscles and glands (Peripheral and Cranial nerves)

LOWER MOTOR NEURON
FUNCTIONAL RELATIONSHIP UMN-LMN

THE UMN EXERTS INHIBITORY ACTIVITY ON THE LMN

UMN LESION

- POSTURAL REACTIONS DEFICIT
- SPINAL REFLEXES NORMAL TO HYPER (CLONIC)
- MUSCLES SPASTICITY
- PATHOLOGICAL REFLEXES (CROSSED EXTENSOR REFLEX)

LMN LESION

- POSTURAL REACTION DEFICIT
- REFLEXES: HYPO OR ABSENT
- DECREASED MUSCLES TONE
- NEUROGENIC ATROPHY
WHICH LIMBS SHOW A NEUROLOGICAL DEFICIT?

- GAIT
- POSTURE
- POSTURAL REACTIONS

HIND LIMBS NEUROLOGICAL DEFICIT (PARAPARESIS, PARAPLEGIA)

- NORMAL FRONT LIMBS

SPINAL REFLEXES
(Patellar, tibias cranialis, withdrawal)

NORMAL TO HYPER: UMN LESION T3-L3
HYPO TO AREFLEXIA: LMN LESION L4-S3

LESION MUST BE CAUDAL TO T2
SPINAL REFLEXES
- TIBIALIS CRANIALIS, LIS: NORMAL TO HYPER
- PATELLAR: HYPO-AREFLEXIA

HIND AND FRONT LIMBS DEFICIT
(tetraparesis, tetraplegia)

Spinal Reflexes
(Extensor Carpi radialis, withdrawal)
- Normal to hyper: Lesion cranial to C6
- Hypo to areflexia: C6-T2 lesion
- Hind limbs: UMN (normal to hyper)
Normal to hyper front limb reflexes: lesion cranial to C6
- If there’re cranial nerve deficits: intracranial lesion
- If NOT: C1-C5 lesion

SPINAL CORD NEUROLOCATION
- CERVICAL SYNDROME
- CERVICO-THORACIC SYNDROME
- THORACO-LUMBAR SYNDROME
- LUMBOSACRAL SYNDROME

ACUTE T3-L3 LOCALIZATION
- SHIFF-SHERRINGTON PHENOMENON
- (paraplegia with front limbs hyperextension)
- “border cells”
INTRACRANIAL LOCALIZATIONS

- FOREBRAIN (PROSENCEPHALON)
  - CEREBRAL HEMISPHERES, DIENCEPHALON
- BRAIN STEM
- CEREBELLUM
- VESTIBULAR SYSTEM

ESSENTIAL QUESTION: IS THERE PARESIS OR PARALYSIS?

* IF YES:
  - BRAIN STEM LESION
* IF NO:
  - FORE BRAIN LESION

BRAIN STEM SYNDROME

- TETRAPARESIS O TETRAPLEGIA
- CRANIAL NERVES DEFICIT (ONE OR MORE)
- DECREASED MENTAL STATUS
- BREATHING PROBLEMS
**SINDROME CEREBRALE**

- NORMAL GAIT
- ABNORMAL POSTURAL REACTIONS
- ABNORMAL MENTAL STATUS
- ABNORMAL BEHAVIOUR
- MENACE REACTION DEFICIT
- VISUAL DEFICIT
- COMPULSIVE GAIT
- [CIRCLING, HEAD PRESSING]
- SEIZURES

**DIENCEPHALIC SYNDROME**

VISUAL DEFICIT
ABNORMAL BEHAVIOUR
POLIURIA POLIDIPSIA
POLIFAGIA, ANOREXIA

**VESTIBULAR SYNDROME**

- VESTIBULAR SYSTEM
  - Peripheral part
  - Central part
VESTIBULAR SYNDROME
CLINICAL SIGNS

• HEAD TILT
• NYSTAGMUS
• VENTRAL STRABISMUS
• VESTIBULAR ATAXIA
• VOMITING (ACUTE PHASE)

VESTIBULAR ATAXIA

• FALLING TOWARD THE SIDE OF LESION
• ROLLING
• CIRCLING
NYSTAGMUS

- HORIZONTAL
  - FAST PHASE OPPOSITE TO THE LESION SIDE
- VERTICAL
- ROTATORY
- POSITIONAL

VESTIBULAR SYNDROME

- PERIPHERAL
  - HEAD TILT
  - HORIZONTAL, ROTATORY NYSTAGMUS
  - VESTIBULAR ATAXIA
  - VENTRAL STRABISMUS
  - FACIAL N. PARESIS
  - HORNER SYNDROME
- CENTRAL
  - HEAD TILT
  - NYSTAGMUS ALL TYPES, VERTICAL, POSITIONAL
  - VESTIBULAR ATAXIA
  - VENTRAL STRABISMUS
  - PROPRIOECEPTIVE DEFICIT
  - PARESIS
CEREBELLAR SYNDROME

- INTENTION TREMOR
- HYPERMETRIA
- WIDE BASED STANCE
- MENACE REACTION DEFICIT
NEUROLOGICAL DEFICIT ALL FOUR LIMBS
(tetraparesis, tetraplegia)

- Generalized hypo-areflexia

- GENERALIZED LOWER MOTOR LESION

NEUROPATHIC SYNDROME

- WEAKNESS, PARESIS, FLACCID PARALYSIS
- DECREASED SPINAL REFLEXES AND MUSCLE TONE
- NEUROGENIC MUSCLES ATROPHY
- (DECREASED SUPERFICIAL PAIN)

CLINICAL CASES

FROM CLINICAL SIGNS TO
NEUROANATOMICAL LOCALIZATION