GUIDE TO LOCALIZING LESIONS

Levels of Localization and their Characteristic Symptoms

Initial hypothesis: *all symptoms result from a focal lesion at one location*
Subsequent hypothesis: if symptoms are bilateral and distributed over many body segments, consider a multifocal (eg multiple sclerosis) or diffuse (eg metabolic, toxic, ALS) disorder.

1. Peripheral Nerves
- ***nondermatomal*** deficit that fits distribution of a peripheral nerve
- **stocking-glove** distribution of deficits
- *nondermatomal* deficit that involves sensory only or motor only symptoms

2. Spinal Nerve Roots
- deficits restricted to a ***single dermatome***
- deficits restricted to single *dermatome* that are purely sensory or motor

3. Spinal Cord
- deficits that fit a ***dermatomal*** distribution that start at a specific dermatome and include all the dermatomes below
- loss of tactile sensation or pain and temperature for the body only
- loss of tactile sensation on one side of the body and pain and temperature on the opposite side of the body (Brown-Sequard syndrome)
- weakness/paralysis on one side of the body and loss of pain and temperature on the opposite side of the body (Brown-Sequard syndrome)
- suspended sensory loss of pain and temperature bilaterally with dermatomes above and below the affected area normal (eg syringomyelia)
- **Long Tracts/Symptoms:** dorsal columns, ALS/pupillary dilation, corticospinal

4. Brainstem
- presence of ***cranial nerve*** deficits
- mix of multiple sensory system deficits or motor and sensory deficits all on opposite side of body
- internuclear ophthalmoplegia
- **Long Tracts/Symptoms:** medial lemniscus/VTT, ALS/pupillary dilation, spinal trigeminal, corticospinal/corticobulbar, MLF, cerebellar peduncles

5. Cortex
- presence of ***cognitive deficits*** along with sensory/motor symptoms
  Cognitive deficits include: language disorders (aphasia), astereognosis, agraphesthesia, loss of 2-point discrimination, extinction on double simultaneous stimulation, neglect, apraxia, deficits in memory and executive functions (reasoning, personality, planning, judgement)
- ***visual field*** hemianopias and quadrantanopias
- **seizures**

- bilateral deficits restricted to foot/leg sensory/motor symptoms (paracentral lobule involvement)
- loss of olfaction

Negative/Positive Effects: Lesions typically produce negative effects (loss of function), but some disease processes can be excitatory and cause positive effects (eg seizures).

Brainstem: this is a crowded location where motor and most sensory pathways travel on their way to other locations. Lesions often involve loss of blood supply or tumors, which typically occur in restricted areas or quadrants and involve adjacent structures (***neighbors*!)** of multiple systems. The proximity of structures is an important factor in their inclusion in the area of a lesion.

Know Your Neighbors! – ML/VTT, ALS/Hypothalamospinal fibers, ML/ALS/Lateral lemniscus

Strategy for brainstem localizing: Sensory or Upper motoneuron symptoms on one side of the body would be caused by lesions on the opposite side of the brainstem above their crossings. Draw out the pathways involved using a simple longitudinal drawing to see where the involved pathways align. Then draw cross-sections to determine where structures are grouped as neighbors.

Pathogenesis
- **Sudden Onset:** vascular
- **Subacute progressing (weeks-months):** tumor
- **Slowly progressing:** neurodegenerative disorder