Localization of Neurological Lesions

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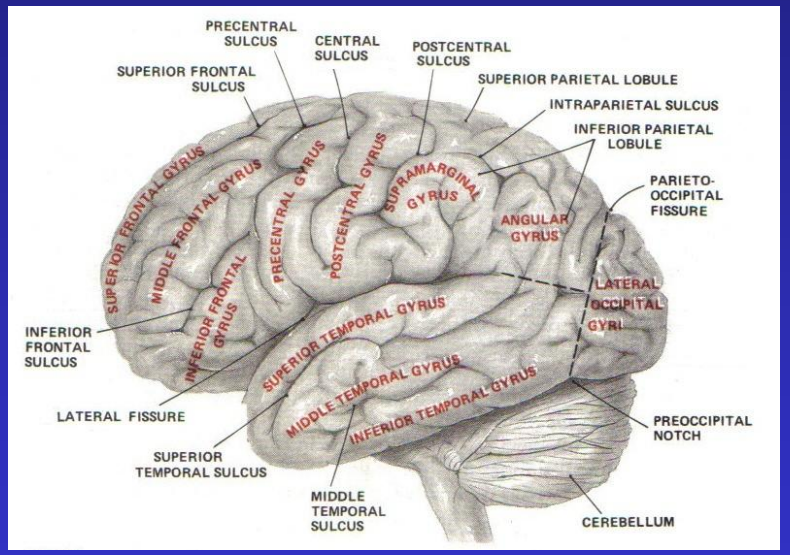
Brain Lesions Suggested by Abnormal Mental Status and Speech

- Mental status: cortex dysfunction - confusion, lethargy/coma
- Speech:
  - Aphasia:
    - Broca's (motor) aphasia: preserved comprehension, non-fluent speech. Lesion to the dominant (left) hemisphere: inferior frontal gyrus of the frontal lobe.
    - Wernicke's aphasia (sensory): poor comprehension, fluent but often meaningless speech. Lesion to the supramarginal gyrus of the parietal lobe and upper part of temporal lobe.

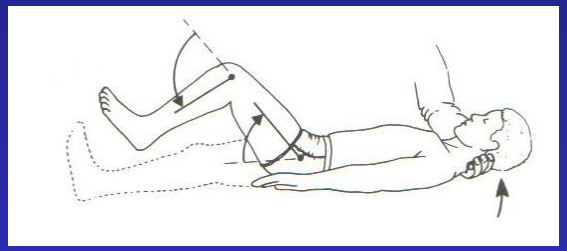


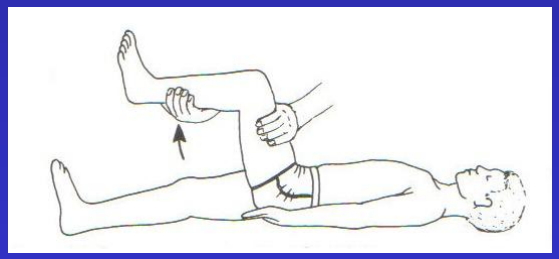
Other Speech Problems

- Speech:
  - Dysphonia: unable to produce normal volume of sound or speaks in a whisper. Lesion of vocal cord, laryngeal problem, myasthenia
  - Dysarthria: slurred speech, lesion in cerebellum, upper and lower motor neuron disease, parkinsonism

Brain Lesions Suggested by the Abnormal Signs

- Meningeal irritation:
  - Neck stiffness
  - Brudzinski sign: lift the head and look for hip and knee flexion.
    - Positive: hip and knee flexion
  - Kernig's sign: flex the leg at the hip with the knee flexed, and try to extend the knee.
    - Positive: resistance to knee straightening

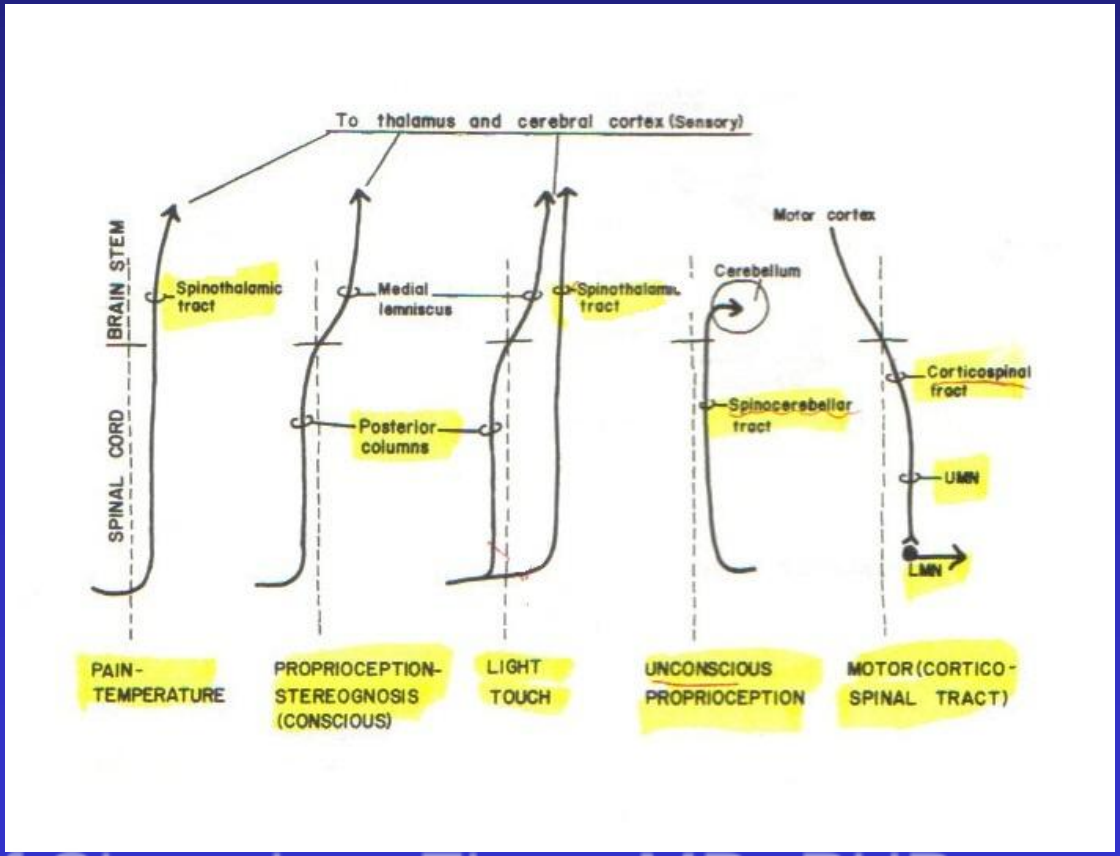




Lesions Suggested by Abnormal Cranial Nerve Function

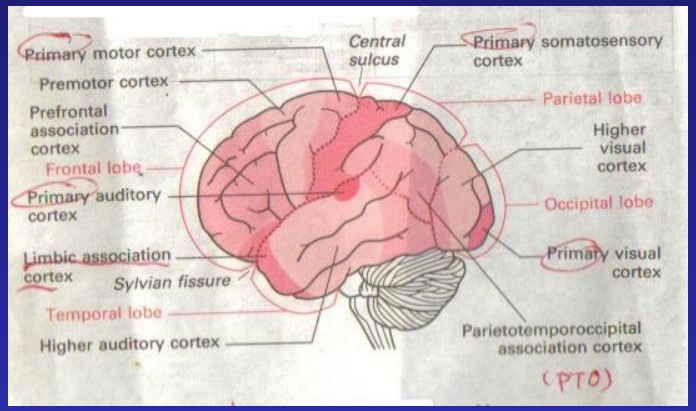
- CN 1: loss of smelling
- CN 2: loss of visual acuity
- CN 3,4,6: loss of extraocular eye movement
- CN 5: abnormal facial sensation, loss of corneal reflex and symmetrical jaw movement
- CN 7: ipsilateral facial weakness
- CN 8: hearing loss
- CN 9, 10: loss of palate elevation and gap reflex
- CN 11: loss of shoulder shrugging function
- CN 12: tongue deviation to the affected side

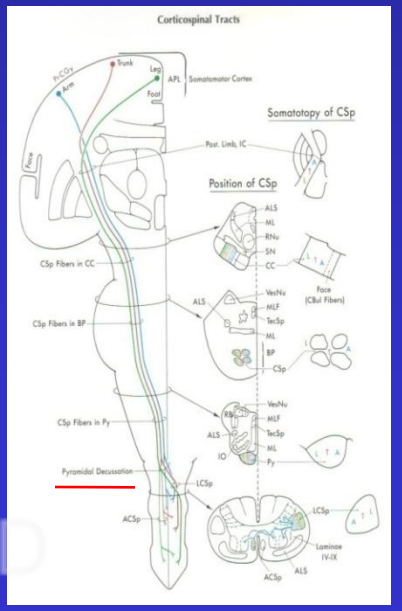
Lesions of Motor, Coordination, and Sensory Pathways (Overview)



Lesions of Motor Pathway – The Descending Corticospinal Tract

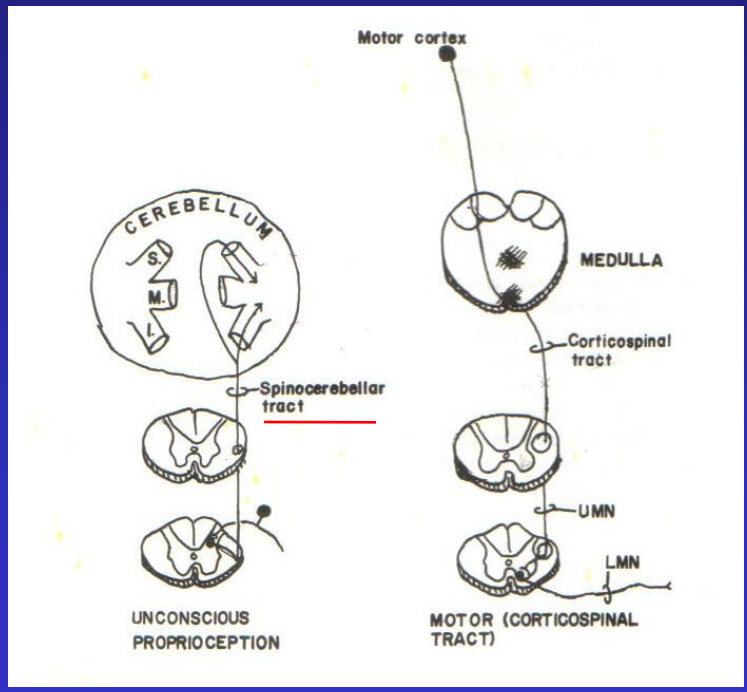
- Lesion above the medulla pyramidal decussation:
  - E.g. motor cortex (frontal lobe), internal capsule, etc
  - Muscle weakness contralateral to the side of lesion
  - Babinski's sign: positive, contralateral to the side of lesion
- Lesion below the decussation:
  - E.g. cervical cord
  - Muscle weakness ipsilateral to the side of lesion
  - Babinski's sign: positive, ipsilateral to the side of lesion



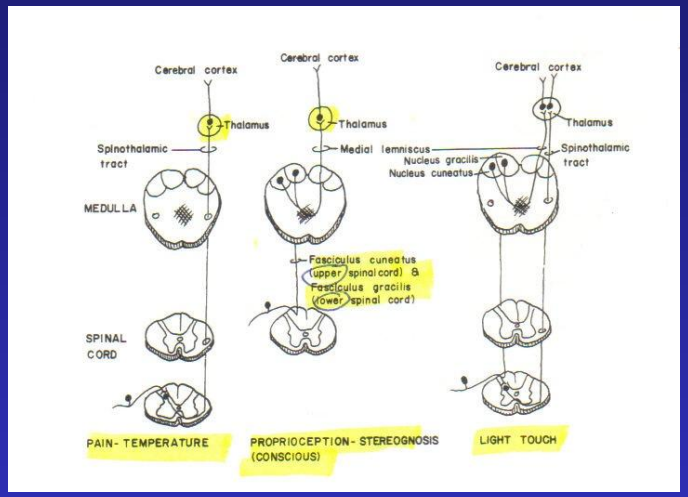


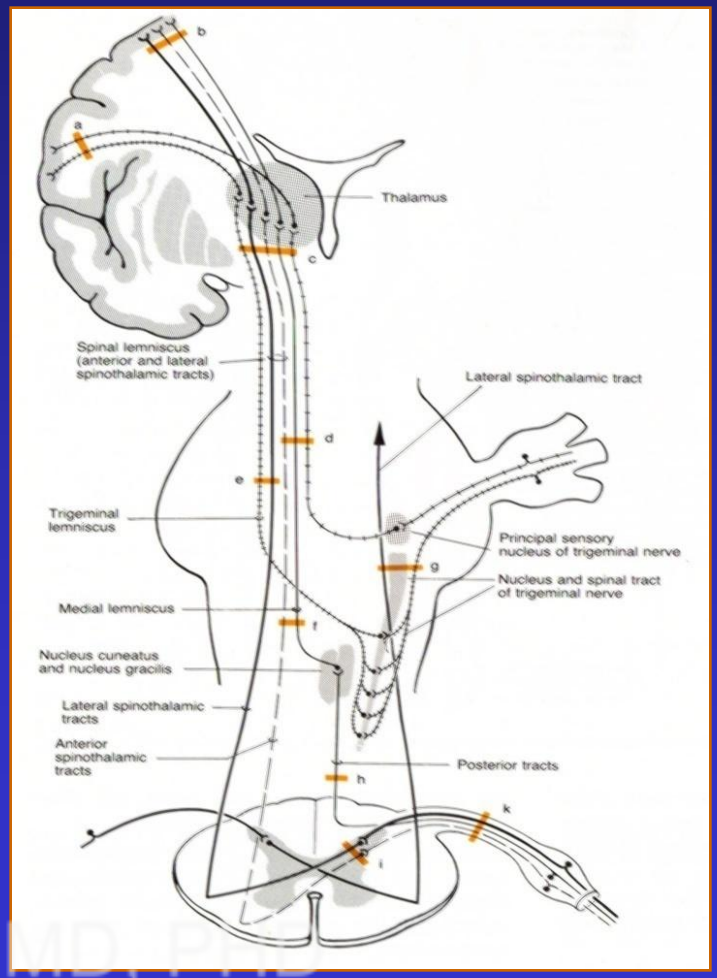
Lesions of the Coordination Pathway – The Spinocerebellar Tract

- Transmitted from the spinal cord to the same side of the cerebellum
- Ataxia to the same side of the lesion in the coordination test.



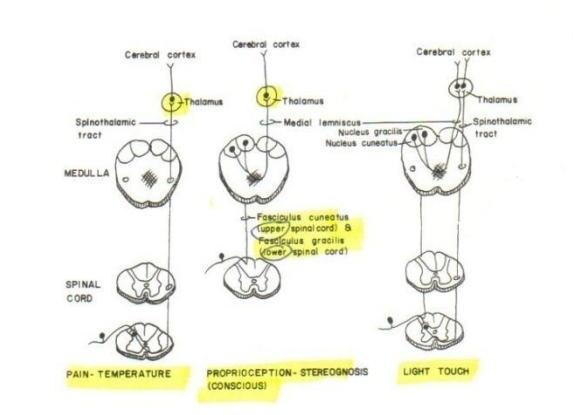
Lesions of the Sensory Pathway – The Spinothalamic Tract

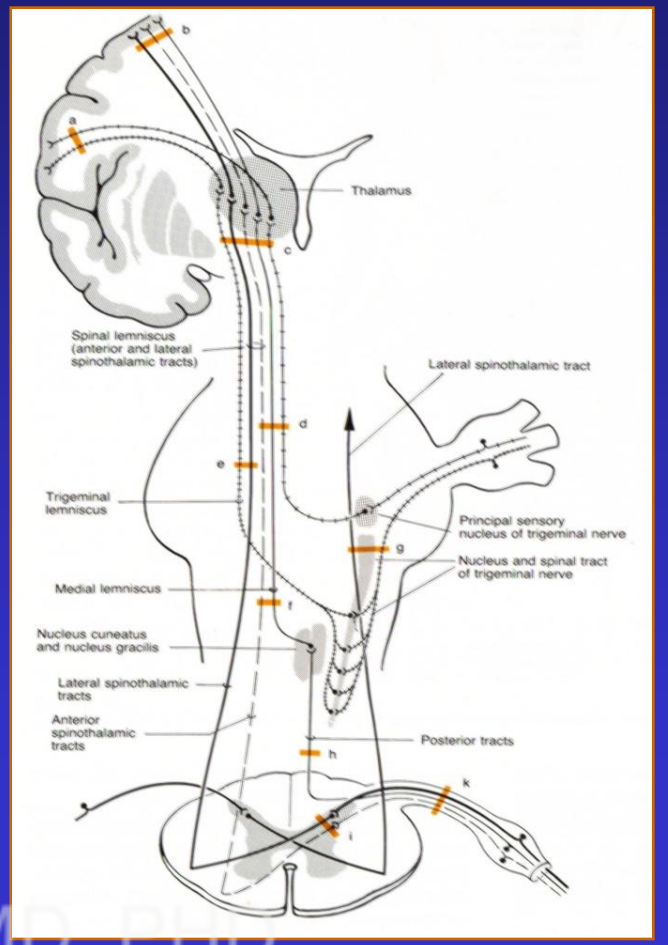




- Loss of pain and temperature on the <u>contralateral</u> side, beginning one level <u>below</u> to the lesion

Lesions of Sensory Pathway – The Dorsal Column - Medial Lemniscus Pathway





- Dorsal column (in spinal cord) - medial lemniscus (in brainstem) tract
  - Below the sensory decussation in the medulla (lesion of the dorsal column): loss of light touch, pressure, vibration, and proprioception/joint positional sense to the ipsilateral side, and below the level of the lesion
  - Above the decussation (lesion of the medial lemniscus): sensory loss of the entire body contralateral to the lesion

Lesions Suggested by the Abnormal Gait

- Stroke or lesion to the frontal motor cortex: hemiplegic gait contralateral to the lesion
- Cerebellar ataxia: deviate to the same side of the lesion
- Loss of posterior column function: sensory ataxia, loss of joint positional sense in Romberg's test
  - Above the sensory decussation in Medulla: contralateral to lesion
  - Below: ipsilateral
- Basal ganglion (striatum: caudate nucleus & putamen, globus pallidus, substantia nigra, subthalamic nucleus, nucleus accumbens) dysfunction: shuffle gait in Parkinson's disease.

Suggested Readings:

- Memorix Neurology by Peter Berlit, 1996
- Neurological Examination Made Easy by Geraint Fuller, 1995
- Clinical Neurological Neuroanatomy Made Ridiculously Simple, by Stephen Goldberg, 1990