





The Neuro Exam

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- I have no financial disclosures.

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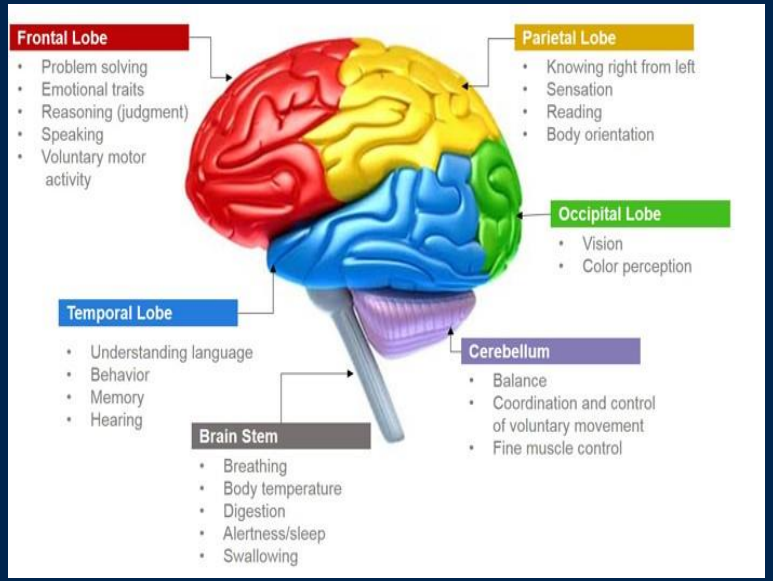
Objectives

- Identify normal brain anatomy
- Identify neuro exam techniques
- Identify variations from normal

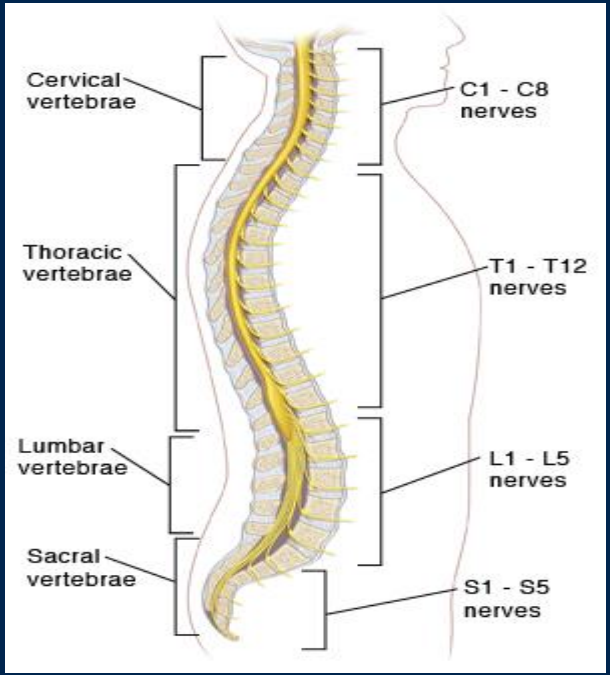
Nervous System Review



Central Nervous System

- Brain
- Cerebrum - frontal lobe, parietal lobe, occipital lobe, temporal lobe
- Diencephalon – thalamus and hypothalamus
- Brainstem – midbrain, pons, medulla
- Cerebellum

Nervous System Review



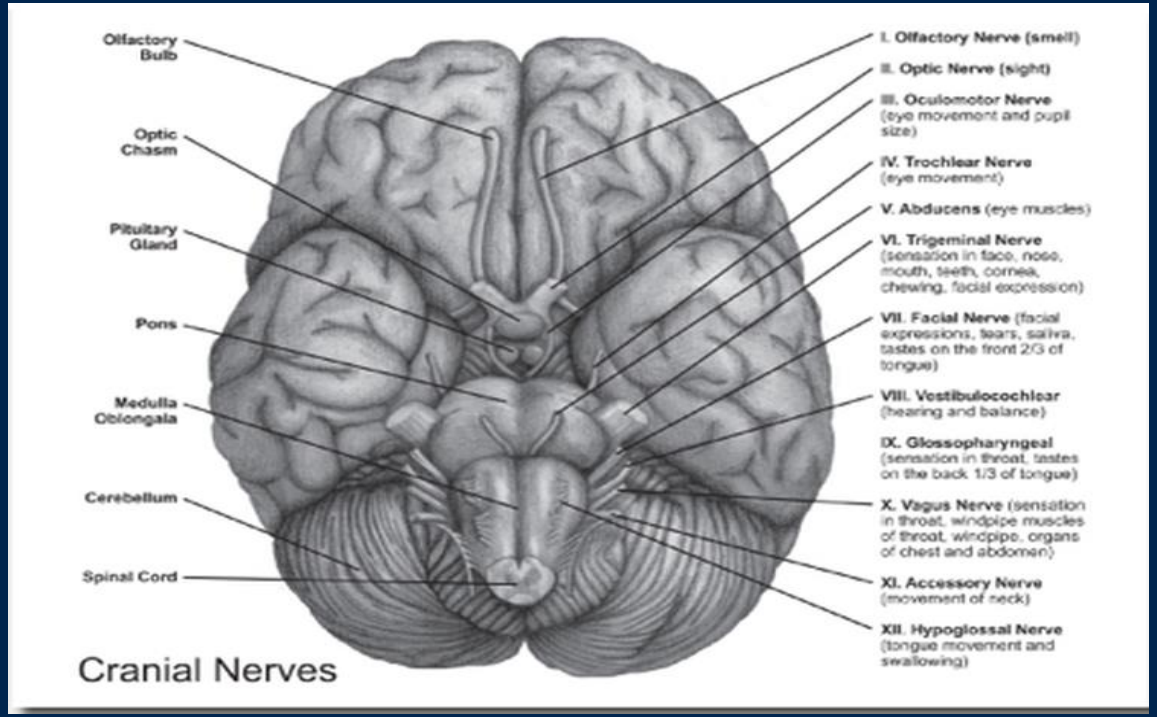
- Central Nervous System
  - Spine
    - 8 cervical vertebrae
    - 12 thoracic vertebrae
    - 5 lumbar vertebrae
    - 5 sacral vertebrae
    - Coccygeal

Nervous System Review

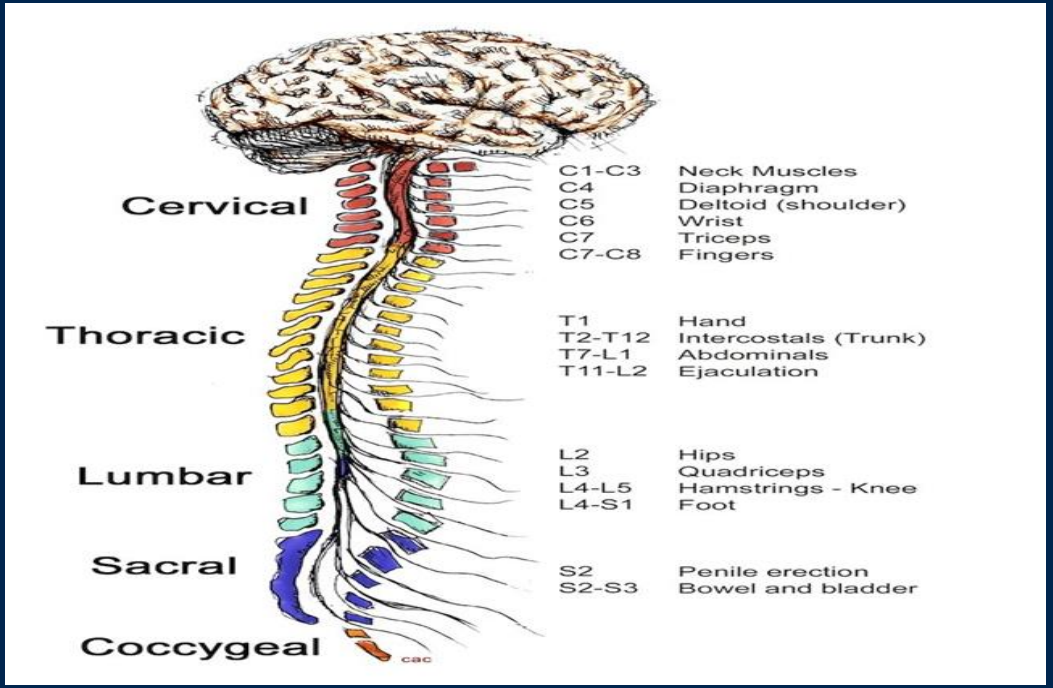
•Peripheral Nervous System

- Cranial Nerves – 12 pairs
- Peripheral Nerves - 31 pairs
  - 8 cervical
  - 12 thoracic
  - 5 lumbar
  - 5 sacral
  - 1 coccygeal

Nervous System Review



Nervous System Review



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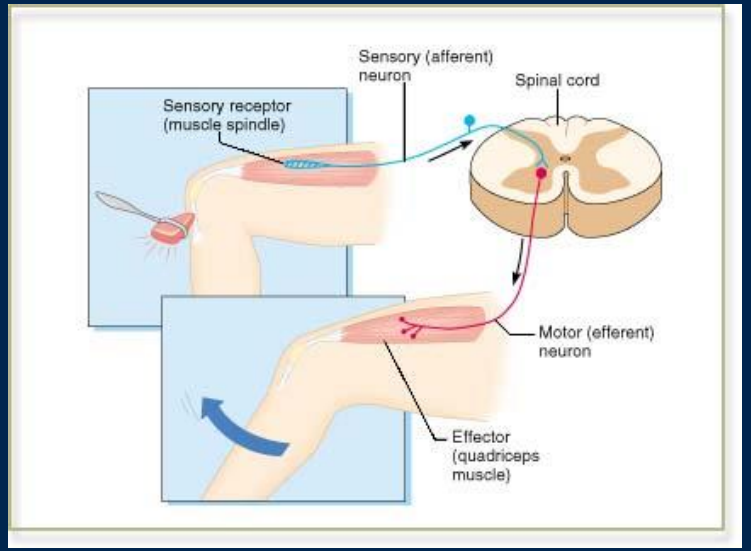
Nervous System Review

Deep Tendon Reflexes

Involuntary stereotypical response that involve at least one afferent (sensory) and one efferent (motor) synapses, across a single synapse.



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Assessment

- Mental status, speech, and language
- Cranial nerves
- Motor system
- Sensory system
- Reflexes

Assessment

Three Questions to ask yourself

- Is the mental status intact?
- Are right-sided and left-sided findings symmetric?
- If there is asymmetry or an abnormal finding, does the lesion lie in the central nervous system or peripheral nervous system?

Assessment

- Mental status
  - Level of alertness
  - Appropriate responses
  - Orientation to person, place, and date

Assessment

The Cranial Nerves			
Nerve Number and Name		Composition	Some Functions
I	Olfactory	Sensory only	Olfaction (smell)
II	Optic	Sensory only	Vision
III	Oculomotor	Motor and sensory	Serves muscles of the eye
IV	Trochlear	Motor and sensory	Serves the superior oblique eye muscle
V	Trigeminal	Motor and sensory	Sensory from face and mouth; motor to muscles of mastication (chewing)
VI	Abducens	Motor and sensory	Serves the lateral rectus eye muscle
VII	Facial	Motor and sensory	Serves the muscles of facial expression, lacrimal glands, and salivary glands
VIII	Vestibulocochlear	Sensory only	Equilibrium and hearing
IX	Glossopharyngeal	Motor and sensory	Serves the pharynx (throat) for swallowing, posterior third of tongue, parotid salivary gland
X	Vagus	Motor and sensory	Sensations from visceral (internal) organs, and parasympathetic motor regulation of visceral organs
XI	Accessory	Motor and sensory	Serves muscles that move head, neck, and shoulders
XII	Hypoglossal	Motor and sensory	Serves muscles of the tongue

Assessment

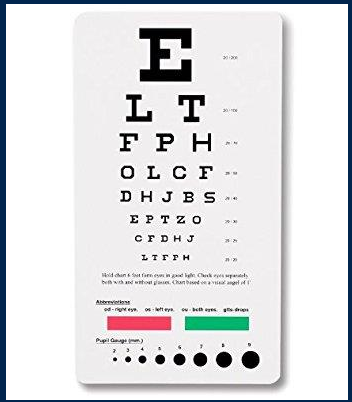
Cranial Nerve 1 - Olfactory

- Sense of smell
- Shortest cranial nerve
- One of two nerves that do not join with the brainstem.

Assessment

Cranial Nerve II – Optic

- Visual acuity – Snellen eye chart
- Visual fields



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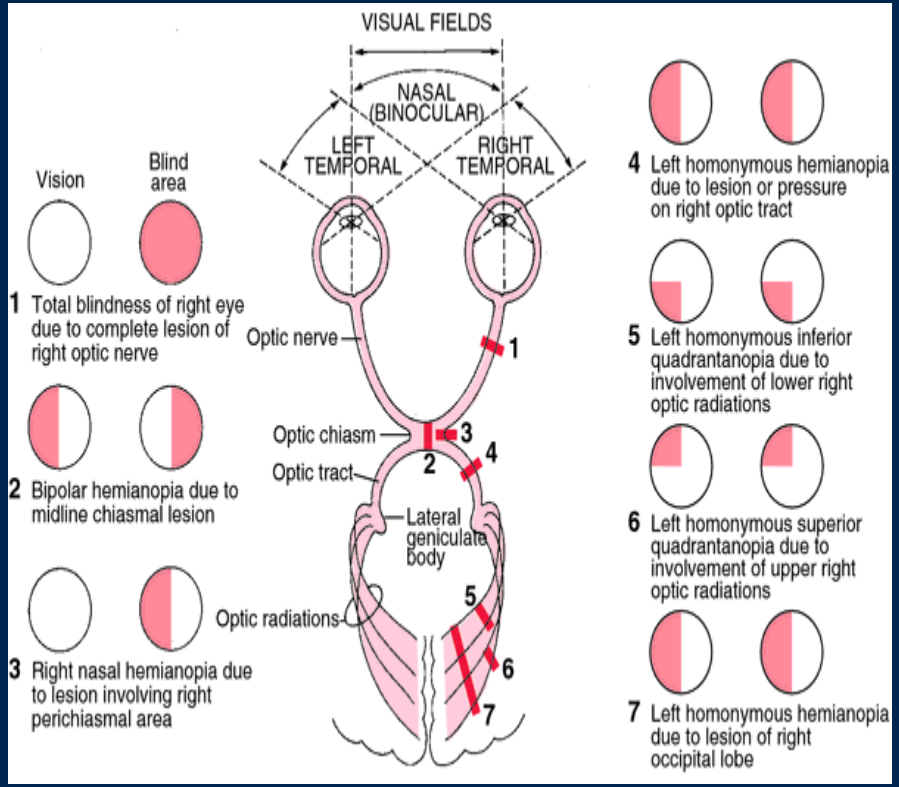
Assessment



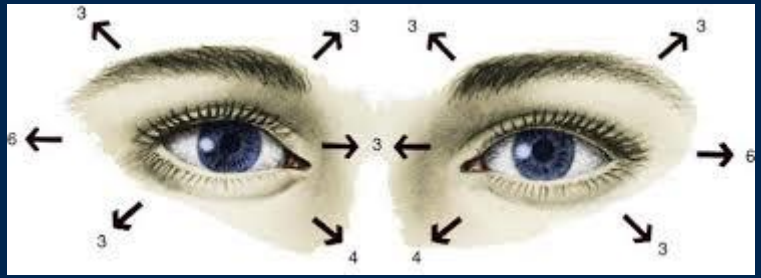
Assessment

Cranial Nerve II & III – Optic and Oculomotor

Assessment

Cranial Nerve III, IV, VI –

Oculomotor, Trochlear, and Abducens



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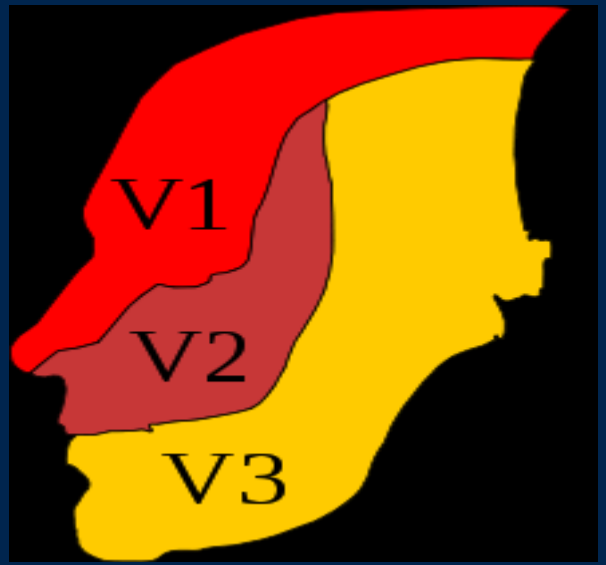
Assessment

Cranial Nerve V – Trigeminal

- Motor and Sensory of face
- Corneal reflex



Assessment

Cranial Nerve VII – Facial

- Raise both eyebrows
- Frown
- Close eyes tightly
- Bare teeth
- Smile
- Puff out both cheeks

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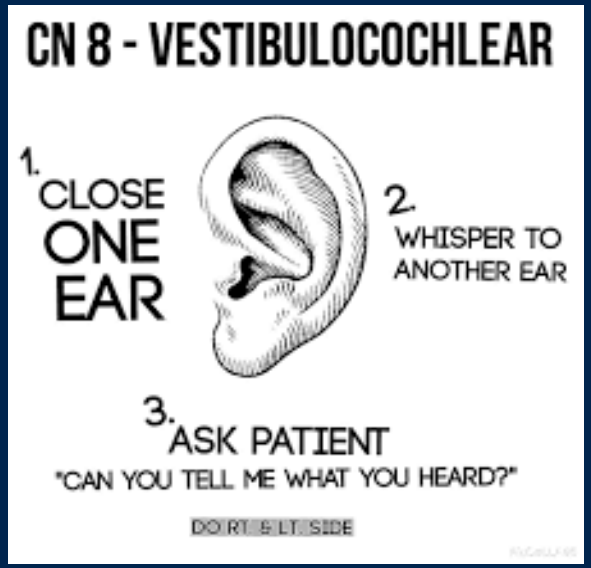
Assessment



- Cranial Nerve VIII - Acoustic

Assessment

- Cranial Nerve IX – glossopharyngeal
- Cranial Nerve X – vagus

Assessment

- Cranial Nerve XI– Spinal Accessory

Assessment

- Cranial Nerve XII – Hypoglossal

Assessment
Muscle Tone

- Inspect muscle bulk – symmetric size and contour
- Inspect muscle tone – assess by feeling muscle's resistance to passive stretch
- Assess muscle strength – shoulders, elbows, wrists, hand, hips, knees, ankle

Assessment

Muscle Strength

- 0 – No muscular contraction detected
- 1 – A barely detectable flicker or trace of contraction
- 2 – Active movement of the body part with gravity eliminated
- 3 – Active movement against gravity
- 4 – Active movement against gravity and some resistance
- 5 – Normal muscle strength – no fatigue against full resistance

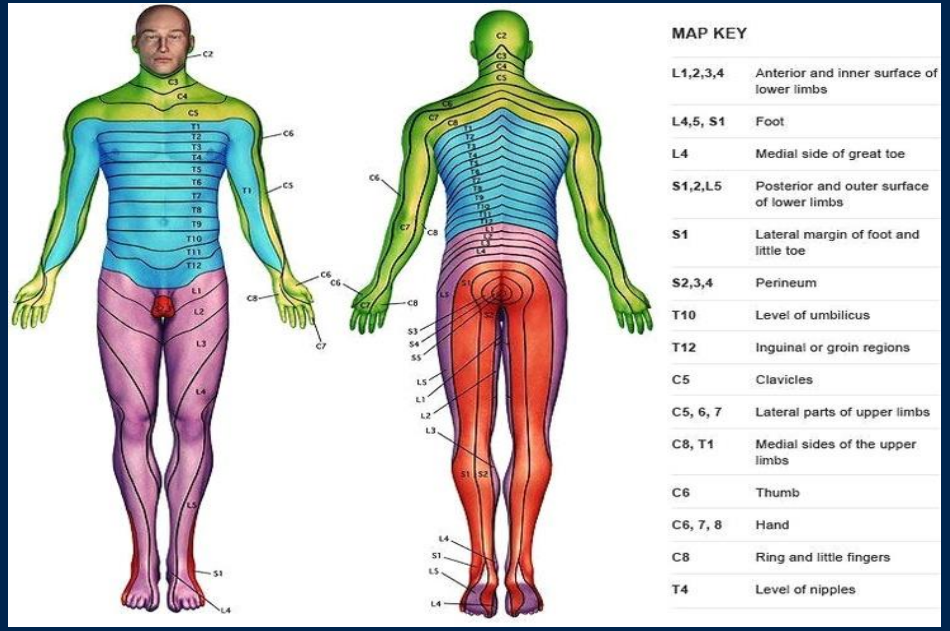
Assessment

Sensory Testing

- Test both distal lower and upper extremities
- Sharp or dull, symmetry
- Wisp of cotton
- Tuning fork
- Proprioception

Assessment

Dermatomes



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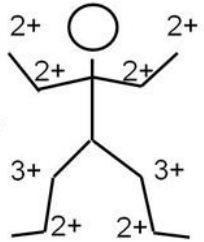
Assessment
Deep Tendon Reflexes

Reflexes

- **Deep tendon reflexes**
  - Biceps reflex C5/C6
  - Brachioradialis reflex C6
  - Triceps reflex C7
  - Patellar reflex L4
  - Achilles tendon S1
- **Plantar response**
- **Reflexes tested in special situations**
  - Spinal cord injury
  - Frontal release signs
  - Posturing
- **Scale**
  - 0 = absent
    1+ = hypoactive
    2+ = normal
    3+ = hyperactive
    4+ = hyperactive with clonus
    5+ = sustained clonus



Clinical shorthand to summarize reflex findings

Assessment

Babinksi Assessment

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Assessment
Coordination

- Finger to nose test – observe for smoothness or tremor
- Heel to chin test – observe for smoothness
- Rapid alternating movements

Assessment

- Assess gait – posture, balance, swinging of arms, leg movements

- Romberg – test of position sense

Assessment

Neuro Exam Checklist

1. CN I – assess smell
2. CN II – visual acuity, visual fields
3. CN II & III – pupillary response to light
4. CN III, IV, & VI – extraocular movements
5. CN V – sensory and motor face; corneal reflex
6. CN VII – facial expressions, close eyes
7. CN VIII – hearing
8. CN IX & X – gag, palate rise

Assessment

Neuro Exam Checklist

9. CN XI – neck turn/shoulder shrug
10. CN XII – tongue movement
11. Motor testing – muscle bulk, tone, strength
12. Sensory testing – pain, light touch, proprioception, vibration
13. Reflexes
14. Coordination
15. Gait, Romberg

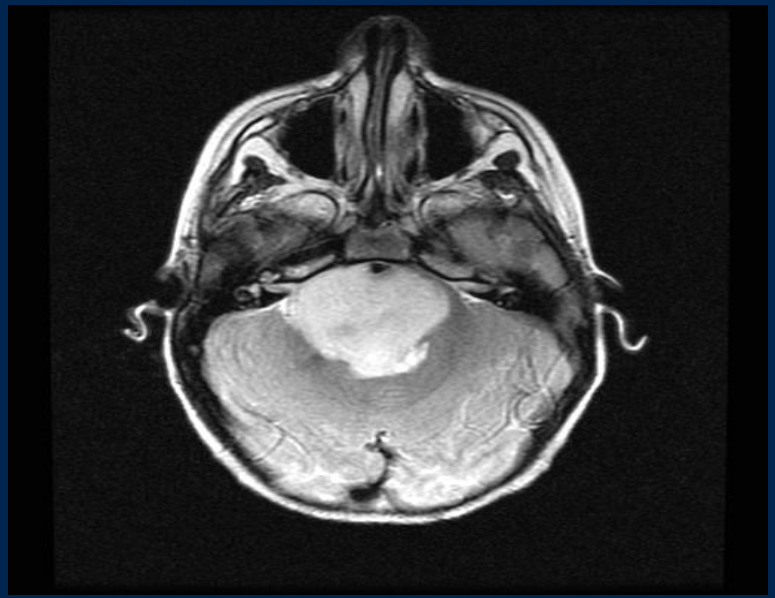
Case Study 1

- 7 year old female with no PMH who presented in clinic with ataxia and right eye esotropia.

- On exam, she is awake and alert, follows commands. Right CN VI palsy. Decreased right facial sensation. Right facial weakness. Positive decreased facial sensation. Positive Romberg. Left patellar reflexes 4+ with 2-3 beats of clonus in the left foot. All other reflexes 2+. Ataxia noted. Unable to tandem walk. Pupils equal 3-4 mm, react briskly. Nystagmus with upward eye movement.

- Where do you suspect to find this patient's lesion?

Case Study 1 (cont'd)

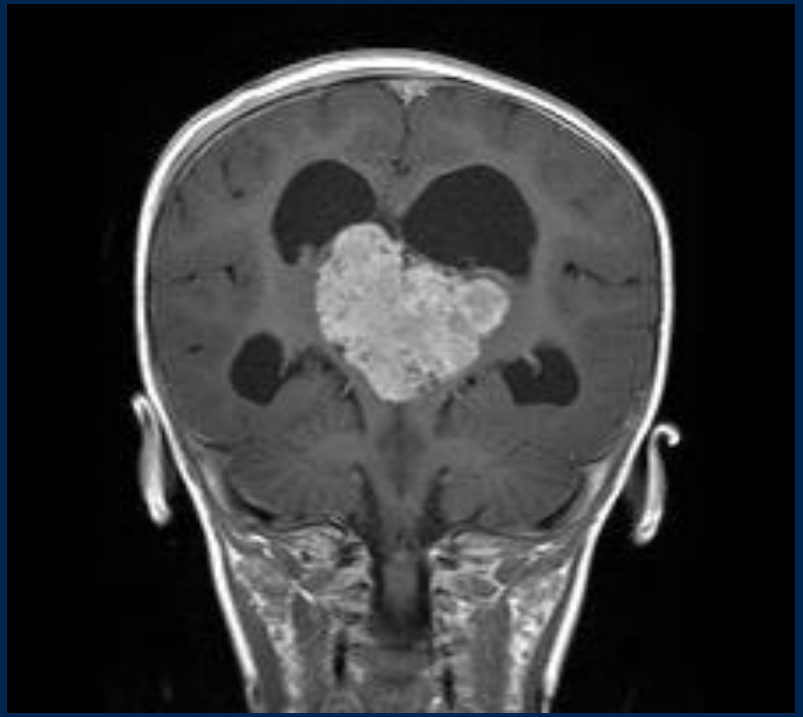


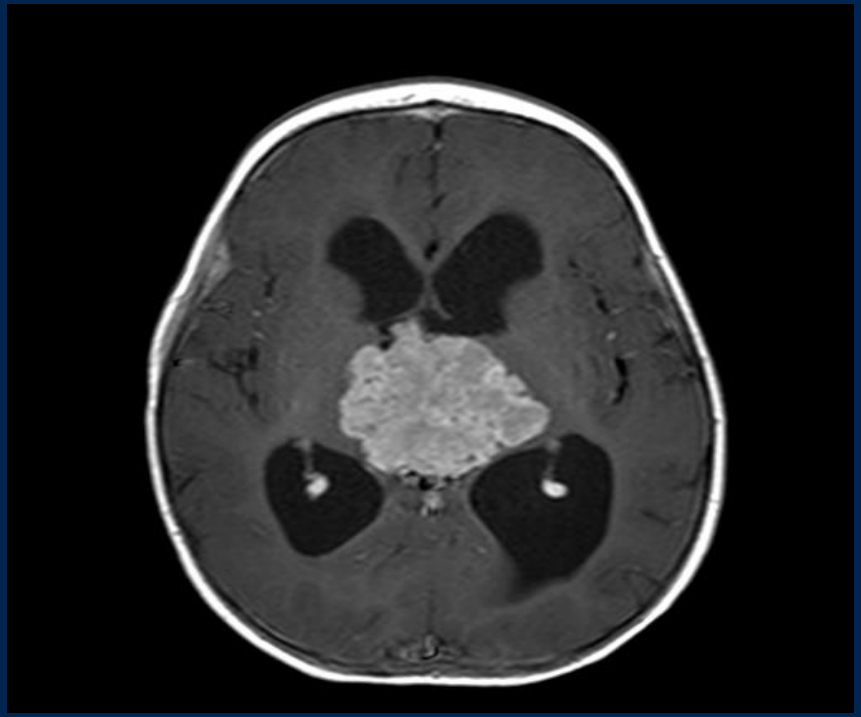
Case Study 2

- 12 month old female with 1-2 week history of progressive lethargy, ataxia, and downward gaze deviation.

- Exam: somnolent, irritable, 4 mm equal and reactive bilaterally, Parinaud's (downward gaze), MAE well, AF full.

Case Study 2 (cont'd)





References

- Bickley, L.S. (2009). *Guide to Physical Examination and History Taking.* Philadelphia, PA: Lippincott Williams & Wilkins.

Thank you

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