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Stroke Education
Posterior Circulation Strokes

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Where Wendy left off...
Case Study

- 68 y/o male (truck driver)

- Nausea and vomiting since last night (pulled over to sleep for a few hours)

- Vertigo this morning (finally made it home)

- Symptoms continued so he presented to the emergency department

- Based on these symptoms, if he were to be having a stroke, where do you think his problem is?
Objectives

Upon completion of this presentation the participant will be able to:

1. Identify vascular territories associated with posterior circulation
2. Discuss the location and function of anatomical structures within posterior circulation
3. Describe the location of stroke based on presenting signs and symptoms
4. List clinical findings that differentiate a cortical stroke from a brainstem stroke
5. Identify the most commonly misdiagnosed stroke syndrome
Cortical vascular territories

- Anterior cerebral artery (yellow)
- Middle cerebral artery (red)
- Posterior cerebral artery (blue)
Posterior Circulation

- Posterior Cerebral Artery
- Vertebrobasilar System
  - Brainstem
  - Cerebellum
Posterior Cerebral Artery

- Occipital Lobe
- Subcortex - Thalami
Occipital Lobe

- Responsible for visual integration
- Brodmann's area 17: Primary visual cortex
- Brodmann's area 18: Visual association cortex
The Visual Pathway

- Information enters the retinal ganglionic cells, travels along the optic nerve fibers, to the optic chiasm, along the optic tract to the lateral geniculate bodies, to the occipital cortex
Infarction in the Occipital Lobe

- Remember: Monocular defects indicate a retinal problem or optic nerve lesion
- Binocular defects involve the optic chiasm or beyond
- Bilateral congruency will increase as the lesion location moves posteriorly
- Homonymous hemianopia will always be posterior to the chiasm
  - Large parietal infarction (MCA)
  - Medial occipital infarction (PCA)
- Cortical blindness is a result of bilateral PCA occlusions (top of basilar artery)
Subcortex-Thalami

- The subcortex contains ascending sensory fibers and descending motor fibers
- Basal nuclei - MCA distribution
- Internal capsule - MCA distribution
- Thalami - PCA distribution (relay of all sensory impulses except olfaction)
The cerebellum can be seen underneath the cerebrum in the inset at left.
Infarction within the Subcortex

- Pure sensory deficit
- Pure motor deficit
- Mixed sensory and motor deficits without cortical deficits
The Vertebrobasilar System

- Cerebellum
- Brainstem
  - Midbrain (Mesencephalon)
  - Pons (Metencephalon)
  - Medulla Oblongata (Mylencephalon)
The Cerebellum

- Fine motor coordination
- Maintenance of muscle tone and posture
- Processes impulses from the vestibular apparatus of the inner ear to maintain equilibrium/balance
Findings in Cerebellar Stroke

- Ataxia: Loss of fine and gross motor coordination with dysmetria (over and undershooting motor responses)
- Ipsilateral side affected
- Presence of motor weakness or sensory loss suggests concurrent brainstem involvement
- Pure cerebellar stroke is less disabling than primary motor stroke
The Brainstem

- A major control center for level of consciousness
- Cranial nerves III - XII
- Ascending sensory fibers
- Descending motor fibers
- Three sections:
The cerebellum can be seen underneath the cerebrum in the inset at left.
Midbrain (mesencephalon)

- Extends from the thalamus to the pons
- Cell bodies for cranial nerves III - IV
- Possible findings with stroke:
  1. Pupillary dilation
  2. EOM dysfunction
  3. Decreased LOC
  4. Motor / Sensory pathway disruption
Pons (metencephalon)

- Extends from the pons to the medulla oblongata
- Cell bodies for cranial nerves V - VIII
- Pneumotaxic center (inhibits depth of respiration, and increases rate of respiration)
- Apneustic center (promotes inspiration)
- Possible findings in stroke:
  1. Disconjugate gaze and diplopia
  2. Locked-in syndrome
  3. Decreased LOC
  4. Motor/Sensory pathway disruption
  5. Respiratory arrest or insufficiency
Medulla Oblongata (mylencephalon)

- Extends from the pons to the spinal cord
- Pyramids - Lateral bulges of white matter; contains the fibers of the corticospinal tract
- Cell bodies for cranial nerves VIII - XII
- Cardiac, vasomotor and respiratory centers
- Possible finding in stroke:
  1. Decreased LOC
  2. Cardiopulmonary and vasomotor instability
  3. Hearing loss
  4. Dysphagia
  5. Sensory/Motor pathway disruption; may include quadriplegia
Symptoms and Signs of a brainstem lesion

Symptoms
- Double vision
- Spinning vertigo
- Bilateral weakness
- Hiccups

Signs
- Eye movements
- Nystagmus
- Horner's syndrome
- Ataxia
- Bilateral signs
The Cranial Nerves

- I - Olfactory
- II - Optic
- III - Oculomotor
- IV - Trochlear
- V - Trigeminal
- VI - Abducens
- VII - Facial
- VIII - Vestibulocochlear
- IX - Glossopharyngeal
- X - Vagus
- XI - Accessory
- XII - Hypoglossal
The Vertebrals
Figure 5. Mechanism of injury in traumatic vertebrobasilar stroke

Figure 5. Mécanisme de lésion dans les accidents vertébrobasiliares traumatiques.
Vertebral Artery Dissection

- Rare
- Traumatic versus spontaneous
- Occipital headache
- Brainstem findings
- Horner's syndrome
What is the most commonly misdiagnosed stroke syndrome?
Basilar Artery Thrombosis
Basilar Artery Thrombosis

- Unusual findings: Double vision, hearing loss, hiccups
- Pure motor/sensory stroke without other deficits
- Mixed motor/sensory loss and vertiginous findings
- Severe stroke with coma, locked-in syndrome or quadriplegia
- Cortical blindness (top of the basilar involving bilateral PCA occlusions)
Case Studies

• 58 y/o male, at a bar visiting friends. Suddenly fell from bar stool, dizzy, unable to stand, vomiting.

• 86 y/o female, vertigo, nausea, vomiting, left visual field cut.
Cortical Vs Brainstem Stroke: The Rules

- Sensory and/or motor loss all on the same side involving the face and extremities indicate a lesion in the cortex, subcortex, thalamus or upper brainstem

- Brainstem lesions exhibit uncommon stroke findings: Hearing loss, vertigo, ocular motor dysfunction

- Sudden loss of consciousness without evidence of a hemorrhagic stroke may be a brainstem stroke

- Cardinal brainstem stroke findings: Cranial nerve deficit on the same side as the infarct with opposite side extremity weakness and/or sensory loss
Ipsilateral Horner's

Ipsilateral sensory alteration of pain and temperature (5th cranial nerve)

Ipsilateral cerebellar ataxia

Contralateral alteration of pain and temperature (Spinothalamic tract)

Add 9th, 10th and 11th for lateral medullary
Add 5th motor, 7th and 8th lateral pontine
Questions

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Thank You!

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