Missed Strokes

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Disclosures

- Funded by Abbott Laboratories to advance development of Abbott’s TBI test for diagnosis and determination of severity of brain injury in adults and children

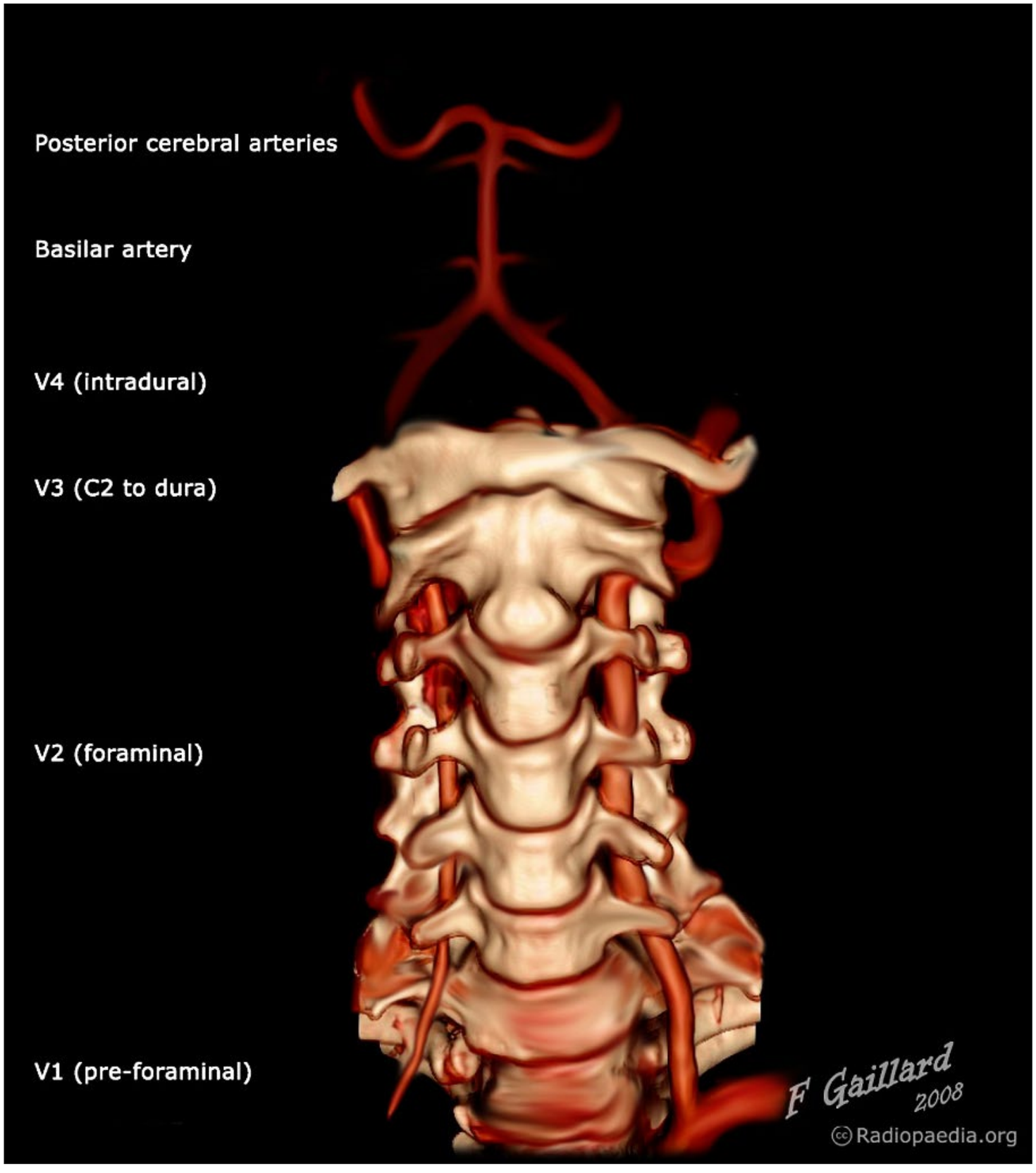
Agenda

- Case
- Missed Strokes
- An Approach to the Comatose Patient (if we get to it)

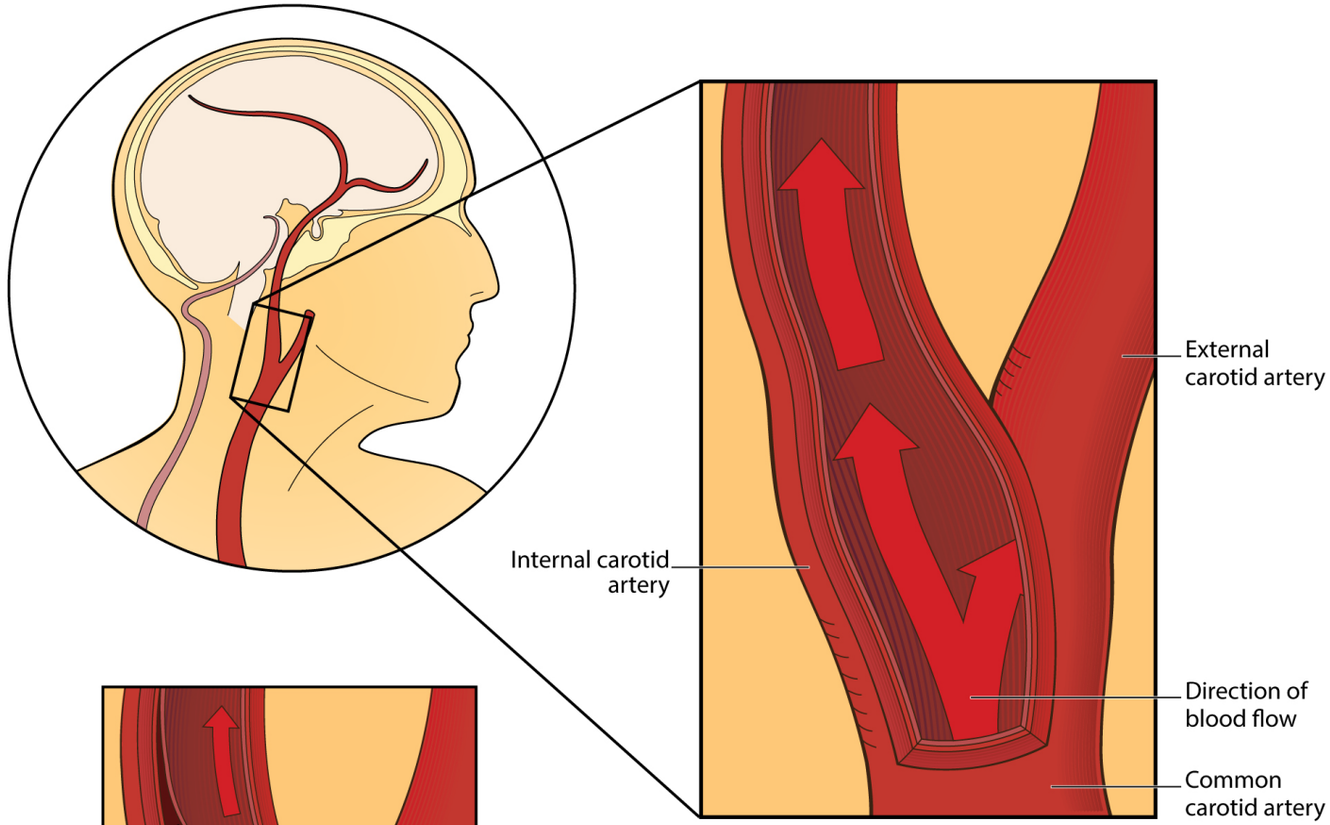
The
Stroke
We
Will
Miss

ED Visit #1

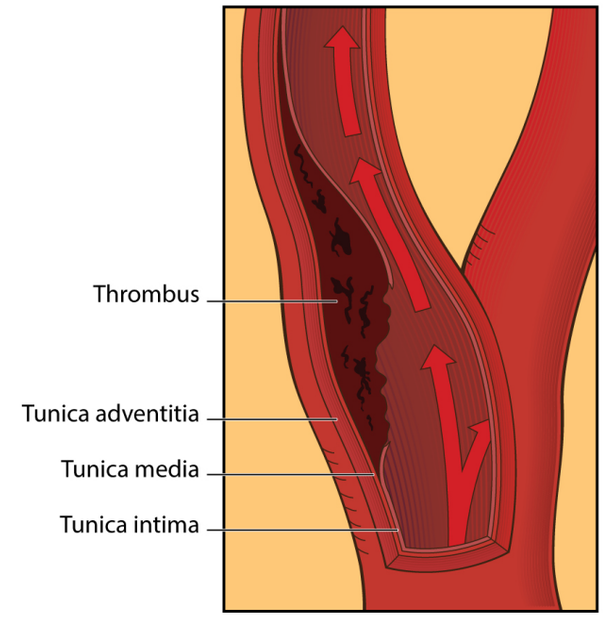
R sided headache/neck pain + R facial numbness



Case courtesy of Dr Jeremy Jones, Radiopaedia.org, rID: 32907

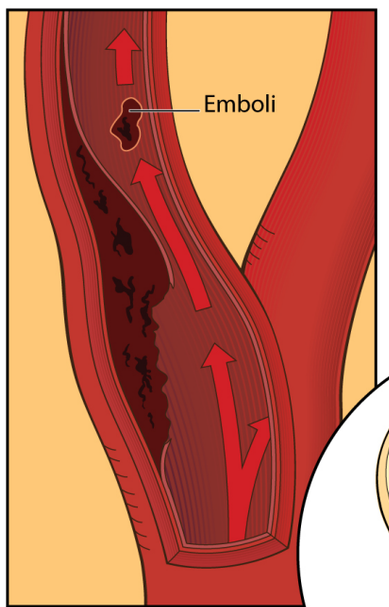


Normal blood flow



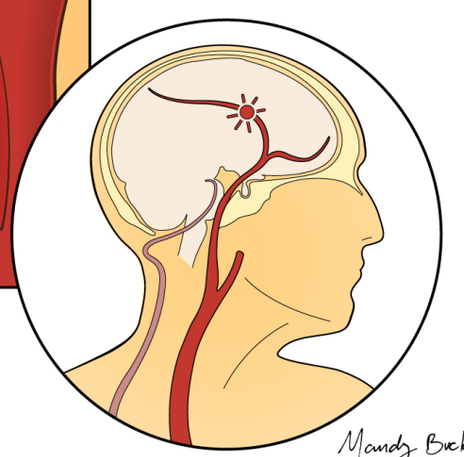
Dissected internal carotid artery

Tunica intima layer of the arterial wall tears. The arterial wall is dissected and a blood clot, or thrombus, forms.



Emboli are formed

Portions of thrombus break away, enter blood flow, and travel through internal carotid artery. Emboli become lodged in the middle cerebral artery and block blood flow to the surrounding tissue.



Mandy Buckner

http://www.painneck.com/carotid-artery-dissection-neck-pain-horners-syndrome/

Finley A, Rogers B, Richards T, Vogel H. Postpartum vertebral artery dissection. BMJ Case Rep. 2015;2015:bcr2015211872. doi:10.1136/bcr-2015-211872.

Epidemiology

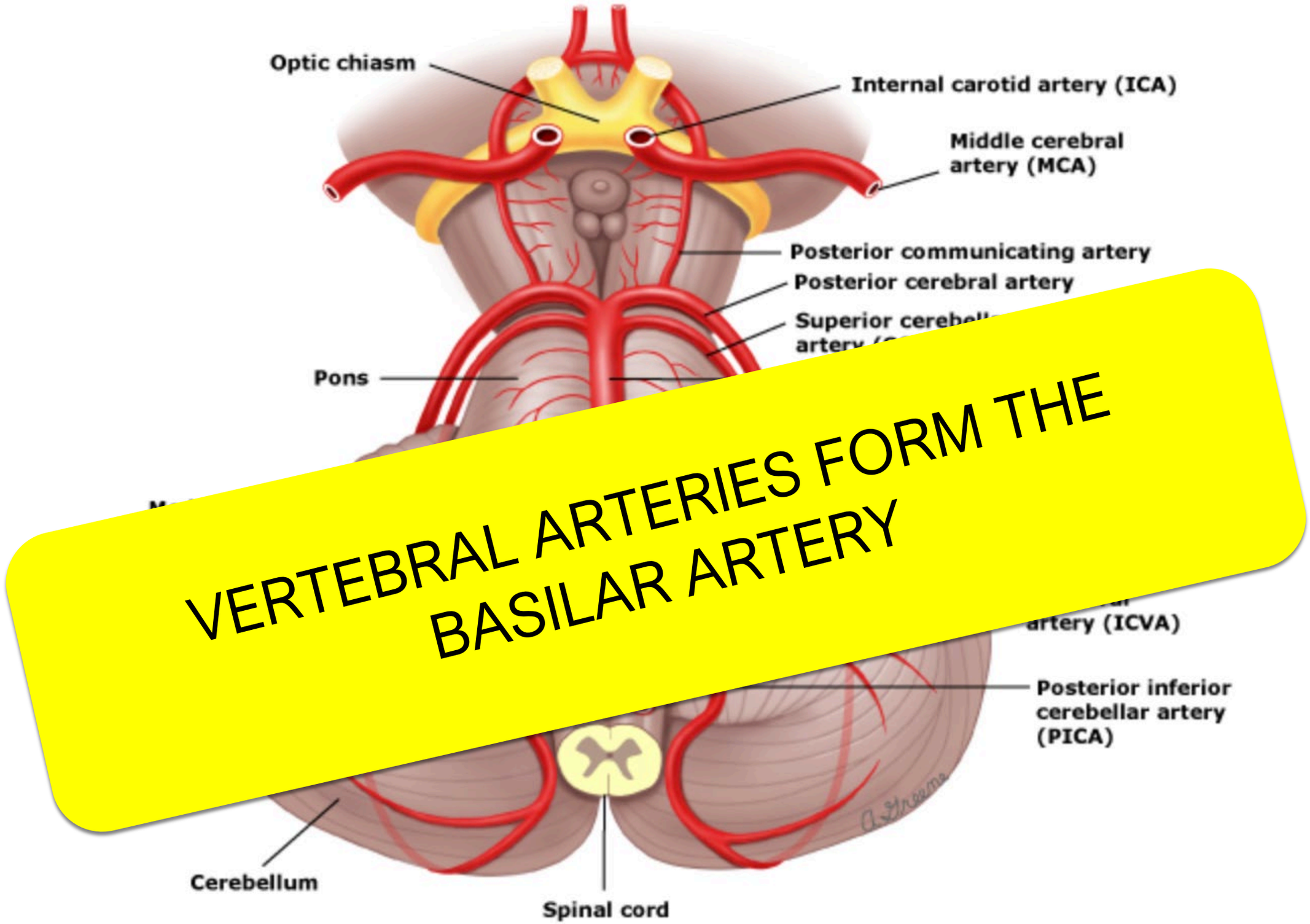
- Incidence: 2.6 per 100,000 per year (?)
- Risk factors: trauma, Ehlers-Danlos, Marfan's, OI, connective tissue disorders, HTN, autumn-winter (!), OCPs…

Debette S, Leys D. Cervical-artery dissections: predisposing factors, diagnosis, and outcome. The Lancet Neurology. 2009;8(7):668-678. doi:10.1016/S1474-4422(09)70084-5.
Lee VH, Brown RD, Mandrekar JN, Mokri B. Incidence and outcome of cervical artery dissection: a population-based study. Neurology. 2006;67(10):1809-1812. doi:10.1212/01.wnl.0000244486.30455.71.

Clinical Presentation

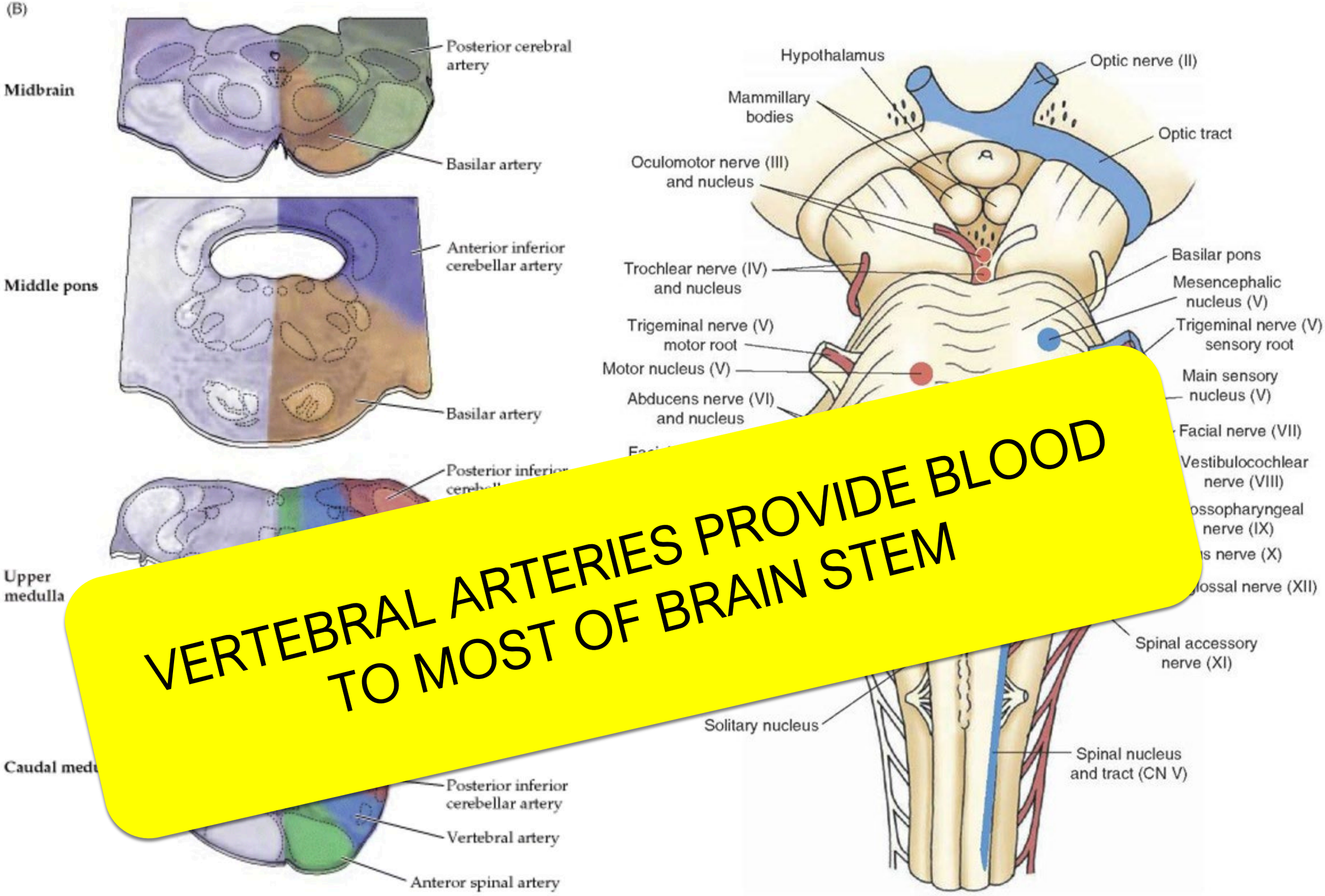
- 77% present with brain ischemia:
  - 67% ischemic stroke
  - 10% transient ischemic attack
- 12% isolated head and/or neck pain
- 8% asymptomatic sVAD

Arnold M, Bousser MG, Fahrni G, et al. Vertebral artery dissection: presenting findings and predictors of outcome. Stroke. 2006;37(10):2499-2503. doi:10.1161/01.STR.0000240493.88473.39.



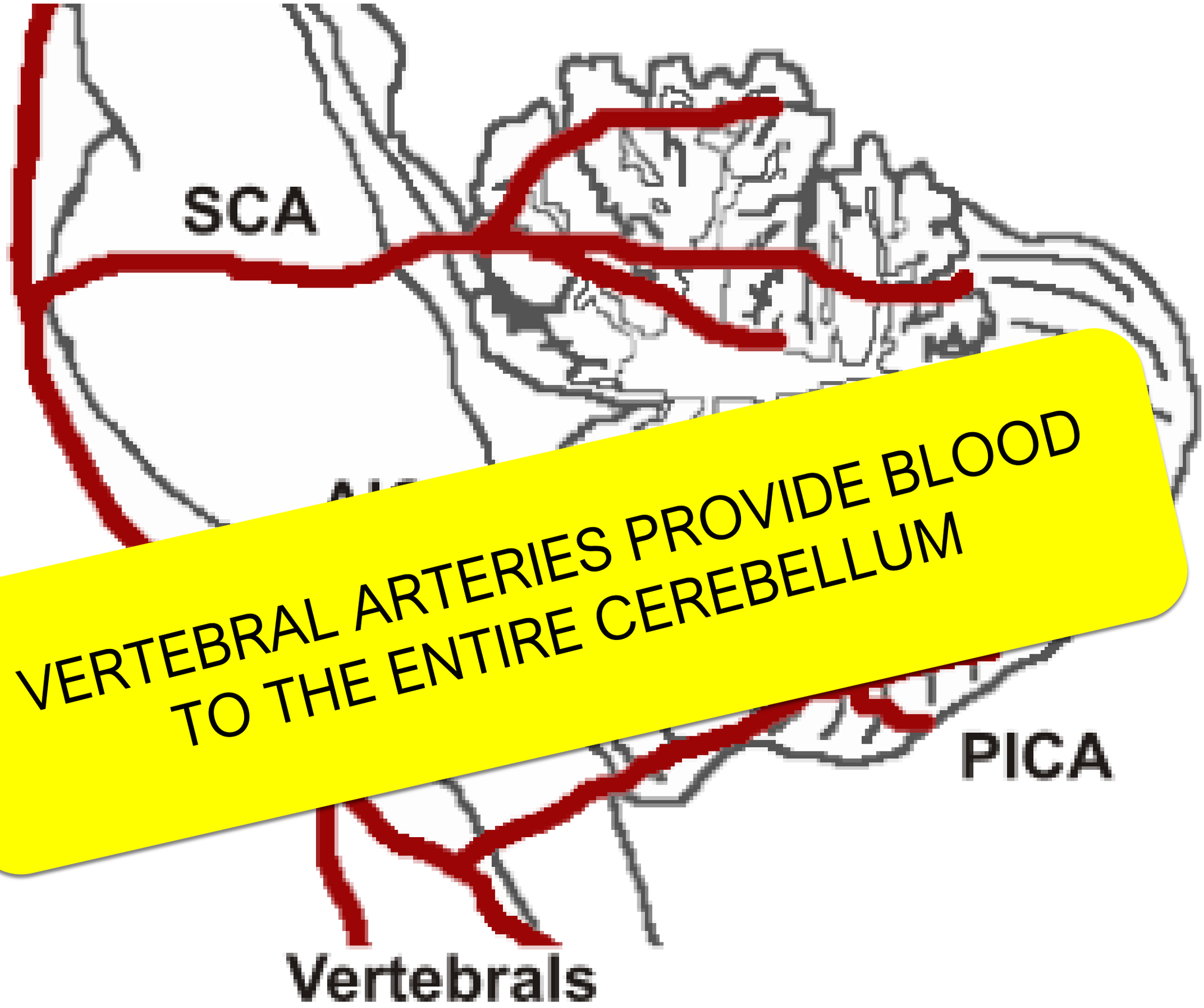
VERTEBRAL ARTERIES FORM THE BASILAR ARTERY

Louis R. Caplan. (2017), Posterior circulation cerebrovascular syndromes. In *UpToDate*. Retrieved April 28, 2018 from https://www-uptodate-com.ucsf.idm.oclc.org/contents/posterior-circulation-cerebrovascular-syndromes?search=posterior%20circulation%20to%20the%20brain&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1



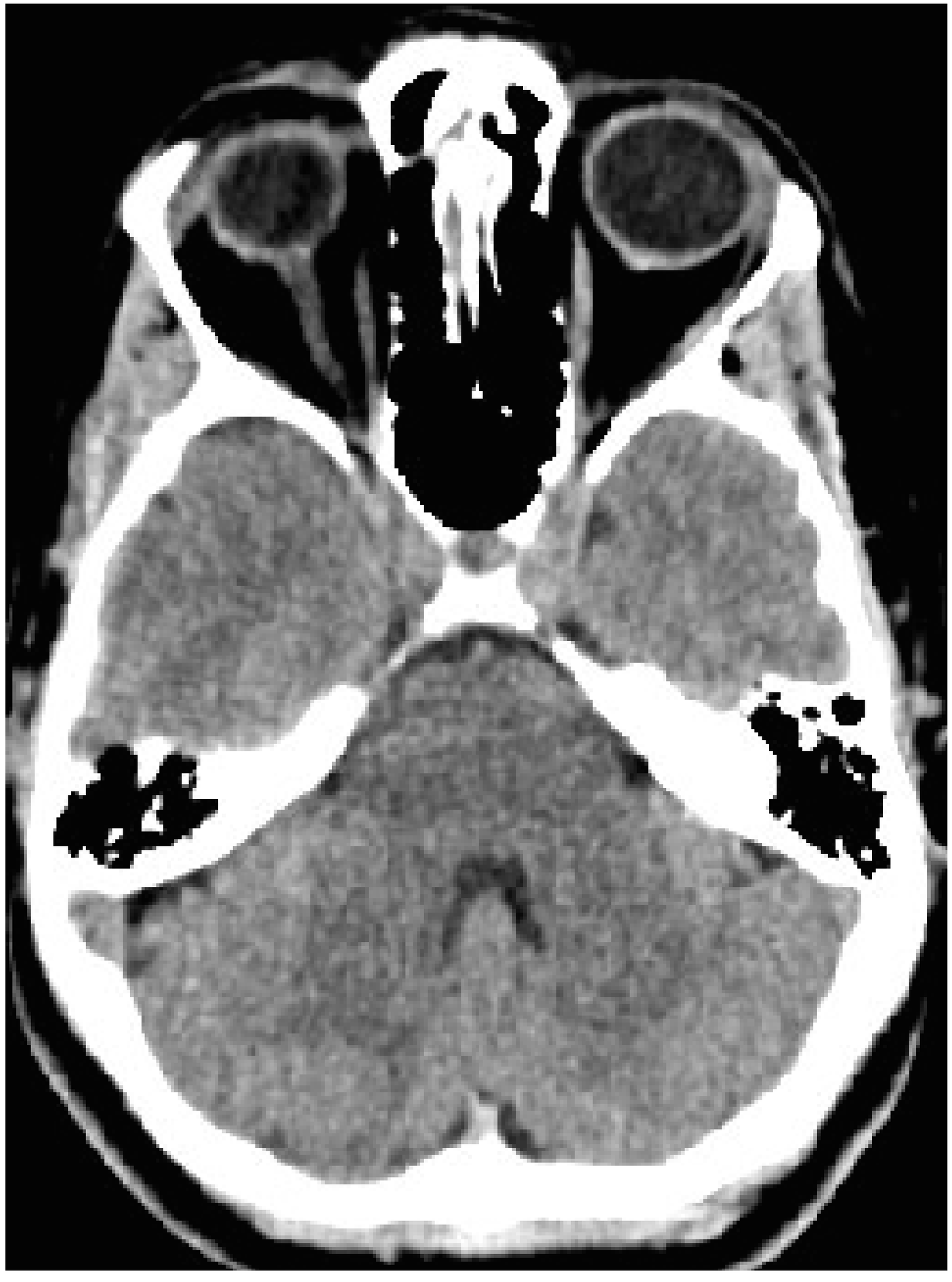
VERTEBRAL ARTERIES PROVIDE BLOOD TO MOST OF BRAIN STEM

Purves D, Augustine GJ, Fitzpatrick D, et al. "The Blood Supply of the Brain and Spinal Cord" In: Neuroscience 2nd edition. Sutherland (MA): Sinauer Associates; 2001.
Whatwhenhow.com



VERTEBRAL ARTERIES PROVIDE BLOOD TO THE ENTIRE CEREBELLUM

en.wikipedia.org



Brain Stem	Cranial Nerves	Blood Supply
Midbrain	III & IV	PCA, Basilar
Pons	V, VI, VII, VIII	silar
Medulla		, PSA,
	gulates balance & eye movements Regulates body & limb movements	SCA, AICA, PICA

VERTEBRAL & BASILAR ARTERIES SUPPLY BLOOD TO THE CRANIAL NERVES & CEREBELLUM

(Some) Cranial Nerve Function

III	Pupil, eye movement
IV	Eye movement
V	Facial sensation
VI	Eye movement
VII	Facial expression
VIII	Hearing, vestibular sense
IX	Palate elevation, gag (and speech)
X	Gag (and speech)
XI	SCM, trapezius

Vertebral Artery Dissection

Severe occipital headache + posterior neck pain + recent (minor) head or neck injury

- Face pain and numbness
- Dysarthria, hoarseness
- N
- D
- Disequilibrium
- Hearing change

HA + NECK PAIN + SOMETHING ELSE

Posterior HA & neck pain?

Pupil, eye movement
Eye movement
Facial sensation
...ng, vestibular sense
Palate elevation, gag (and speech)
Gag (and speech)

TIP: LOOK FOR THE SOMETHING ELSE!

ED Visit #1

R sided headache/neck pain + R facial numbness

TIP: LOOK FOR THE SOMETHING ELSE

Pupil, eye movement
Eye movement
Facial sensation
Facial expression
Hearing, vestibular sense
Palate elevation, gag (and speech)
Gag (and speech)

ED Visit #1

- 77% present with brain ischemia:
  - 67% ischemic stroke
  - **10% transient ischemic attack**

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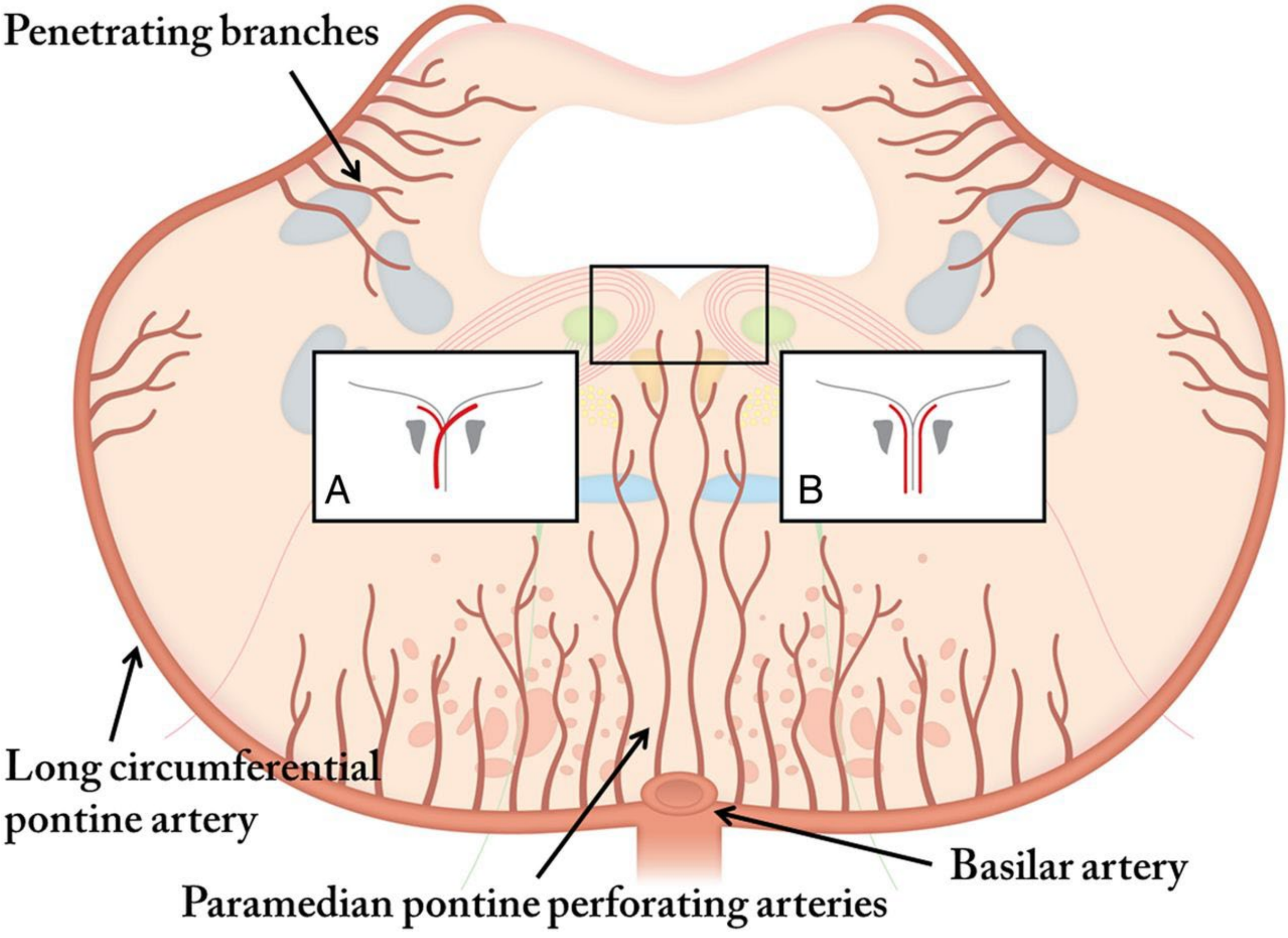
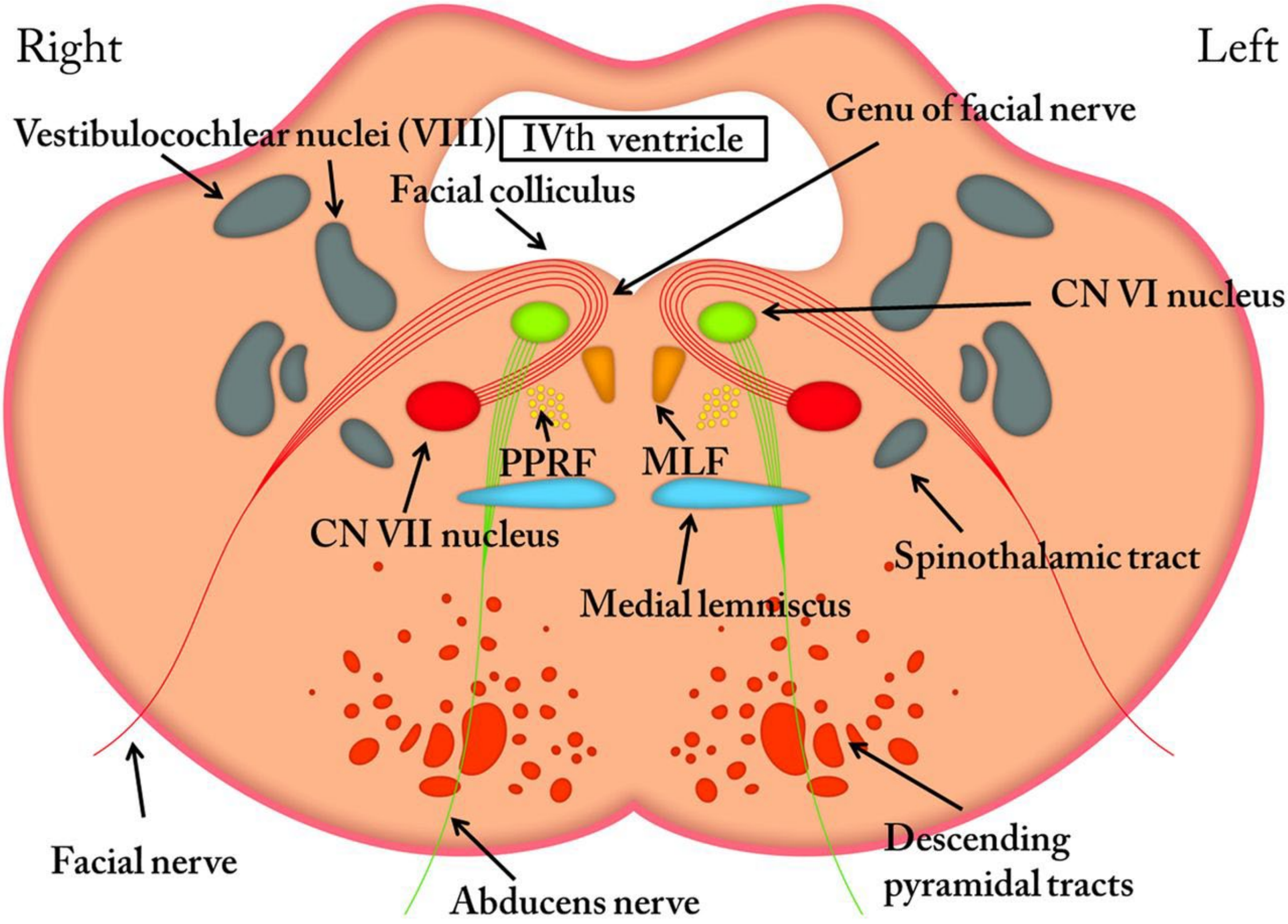
ED Visit #2

"Non-stop seizures"



Evans MRB, Weeks RA. Putting pontine anatomy into clinical practice: the 16 syndrome. Pract Neurol. 2016;16(6):484-487. doi:10.1136/practneurol-2016-001367.



Evans MRB, Weeks RA. Putting pontine anatomy into clinical practice: the 16 syndrome. Pract Neurol. 2016;16(6):484-487. doi:10.1136/practneurol-2016-001367.

Missed Stroke

- Academic hospital = community hospital
- **33%** within 3-hour time window

Arch AE, Weisman DC, Coca S, Nystrom KV, Wira CR, Schindler JL. Missed Ischemic Stroke Diagnosis in the Emergency Department by Emergency Medicine and Neurology Services. Stroke. 2016;47(3):668-673. doi:10.1161/STROKEAHA.115.010613.

Missed Strokes

- 35% seen by neurology in ED
- 8% triaged as stroke codes
- 18% missing neuro exams (academic hospital)
- 65% missing neuro exam (community hospitals)

Arch AE, Weisman DC, Coca S, Nystrom KV, Wira CR, Schindler JL. Missed Ischemic Stroke Diagnosis in the Emergency Department by Emergency Medicine and Neurology Services. Stroke. 2016;47(3):668-673. doi:10.1161/STROKEAHA.115.010613.

Missed Strokes

- 40% mi

1. SUSPECT STROKE
2. DO A FOCUSED NEURO EXAM

Arch AE, Weisman DC, Coca S, Nystrom KV, Wira CR, Schindler JL. Missed Ischemic Stroke Diagnosis in the Emergency Department by Emergency Medicine and Neurology Services. Stroke. 2016;47(3):668-673. doi:10.1161/STROKEAHA.115.010613.

Missed Strokes

- Common complaint
  dizzine
  odds of missed

SOUND FAMILIAR YET?

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Missed Strokes

- **>20%** of acute ischemic strokes missed
- **Posterior circulation strokes** nearly **3×** more likely to be missed

Arch AE, Weisman DC, Coca S, Nystrom KV, Wira CR, Schindler JL. Missed Ischemic Stroke Diagnosis in the Emergency Department by Emergency Medicine and Neurology Services. Stroke. 2016;47(3):668-673. doi:10.1161/STROKEAHA.115.010613.

More Missed Strokes

- **10.4%** involved dizziness or headache diagnosis

- **Non-teaching hospitals** demonstrated **45% higher odds** of missed stroke than teaching hospitals (OR 1.45; $p < 0.001$).

Newman-Toker DE, Moy E, Valente E, Coffey R, Hines AL. Missed diagnosis of stroke in the emergency department: a cross-sectional analysis of a large population-based sample. Diagnosis (Berl). 2014;1(2):155-166. doi:10.1515/dx-2013-0038.

Missed Strokes

- **Males** had **25% lower odds** of misdiagnosis
- **Increasing age** decreasing odds of missed stroke
  - Proportion of probable missed strokes: 3.98% (18–44), 1.70% (45–64), 0.91% (65–74), 0.59% (75+).

Newman-Toker DE, Moy E, Valente E, Coffey R, Hines AL. Missed diagnosis of stroke in the emergency department: a cross-sectional analysis of a large population-based sample. Diagnosis (Berl). 2014;1(2):155-166. doi:10.1515/dx-2013-0038.

Missed Strokes

- Compared to **non-Hispanic White** patients, higher odds of a missed stroke diagnosis:
  - **Black** (OR 1.18; p = 0.02)
  - **Asian/Pacific Islander** (OR 1.29; p = 0.02)
  - **Hispanic** (OR 1.30; p < 0.001).
- **Women:** greater odds of misdiagnosis

Newman-Toker DE, Moy E, Valente E, Coffey R, Hines AL. Missed diagnosis of stroke in the emergency department: a cross-sectional analysis of a large population-based sample. Diagnosis (Berl). 2014;1(2):155-166. doi:10.1515/dx-2013-0038.

Missed Strokes

- **No sex difference** in **mean number of symptoms** reported by individual patient
- **Nontraditional stroke symptoms**, pain and change in level of consciousness more often reported by women
- Nontraditional stroke symptoms:
  - 28% women
  - 19% men

Labiche LA, Chan W, Saldin KR, Morgenstern LB. Sex and acute stroke presentation. Ann Emerg Med. 2002;40(5):453-460.

Missed Strokes

- Younger age
- Nausea/vomiting
- Dizziness
- Altered mental status
- Women
- People of color

The
Stroke
We
Will
Not
Miss

Dizziness

Dizziness

Central

Posterior circulation stroke
Tumor
Migraine

Peripheral

ermittent

PPV

HiNTS

Head Impulse

Nystagmus

Test (of) Skew

COME TO MY NEURO EXAM LECTURE

Coma

WHAT IS COMA?

- State of deep unconsciousness
- Unresponsive

COMA:

- Can be transitory
  - Prolonged
- Last indefinitely

HOW COMMON IS COMA?

If you take away TBI and cardiac arrest, about 0.4% of all ED patients

COMA = BRAIN FAILURE

Coma

Coma = Unconscious or Unresponsive

Problem in the brain

Problem outside the brain

Coma = Unconscious or Unresponsive

Problem outside the brain

PROBLEMS OUTSIDE THE BRAIN:

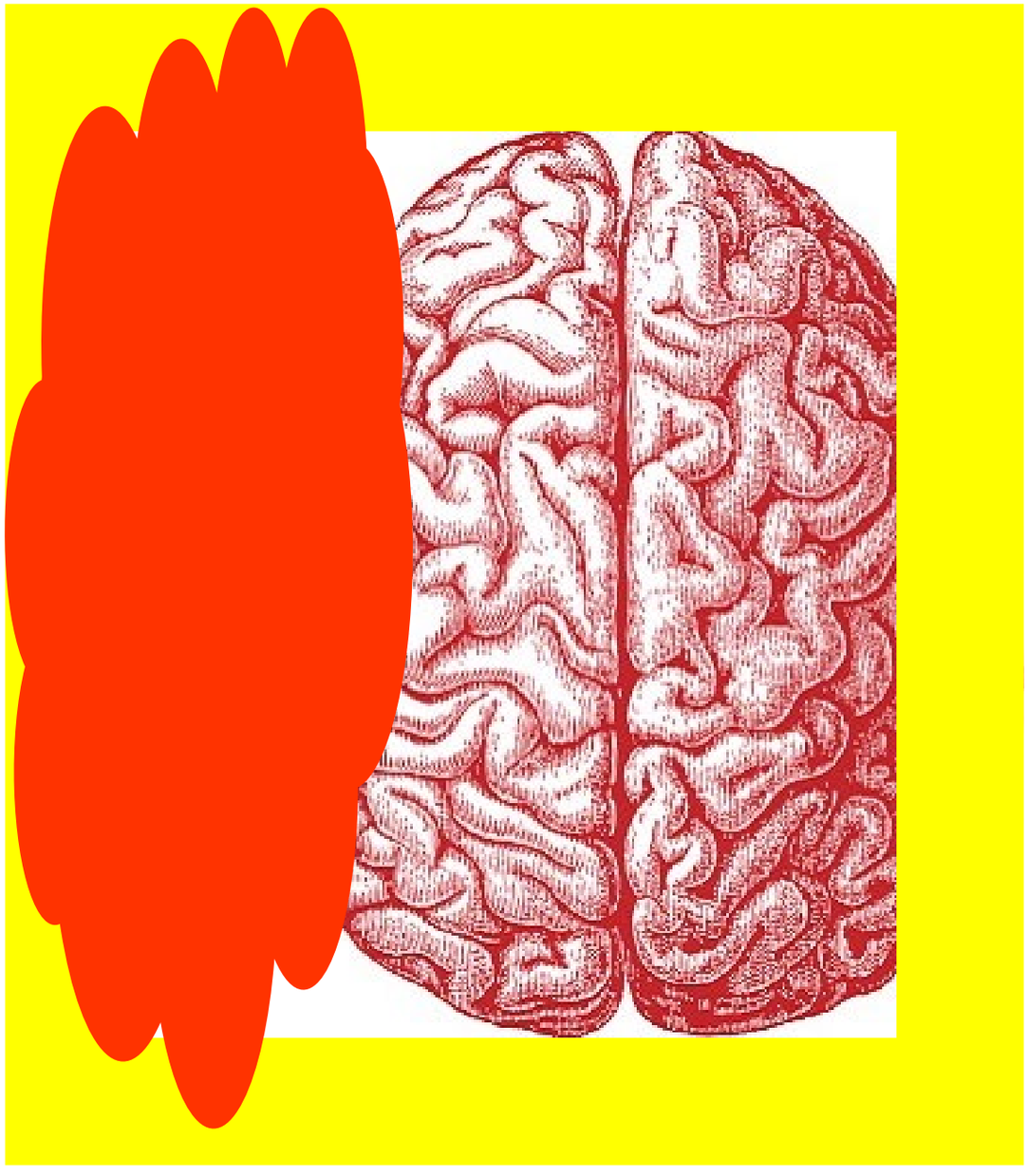
- Hypoglycemia
- Drug overdose
- Medication overdose
- ETOH
- Hepatic encephalopathy
- Sepsis

Coma =
Unconscious or
Unresponsive

Problem in the brain

PROBLEMS IN THE BRAIN:

- Meningitis
- Encephalitis
- Subdural hematoma/TBI
- Anoxic brain injury
- Intracerebral hemorrhage
- Brainstem strokes
- Status epilepticus



Coma = Unconscious or Unresponsive

Problem in the brain

Problem with both sides of brain

Problem with brainstem

Coma = Unconscious or Unresponsive

Problem in the brain

Problem with both sides of brain

Problem with brainstem

Problem within brainstem

Problem pushing into brainstem

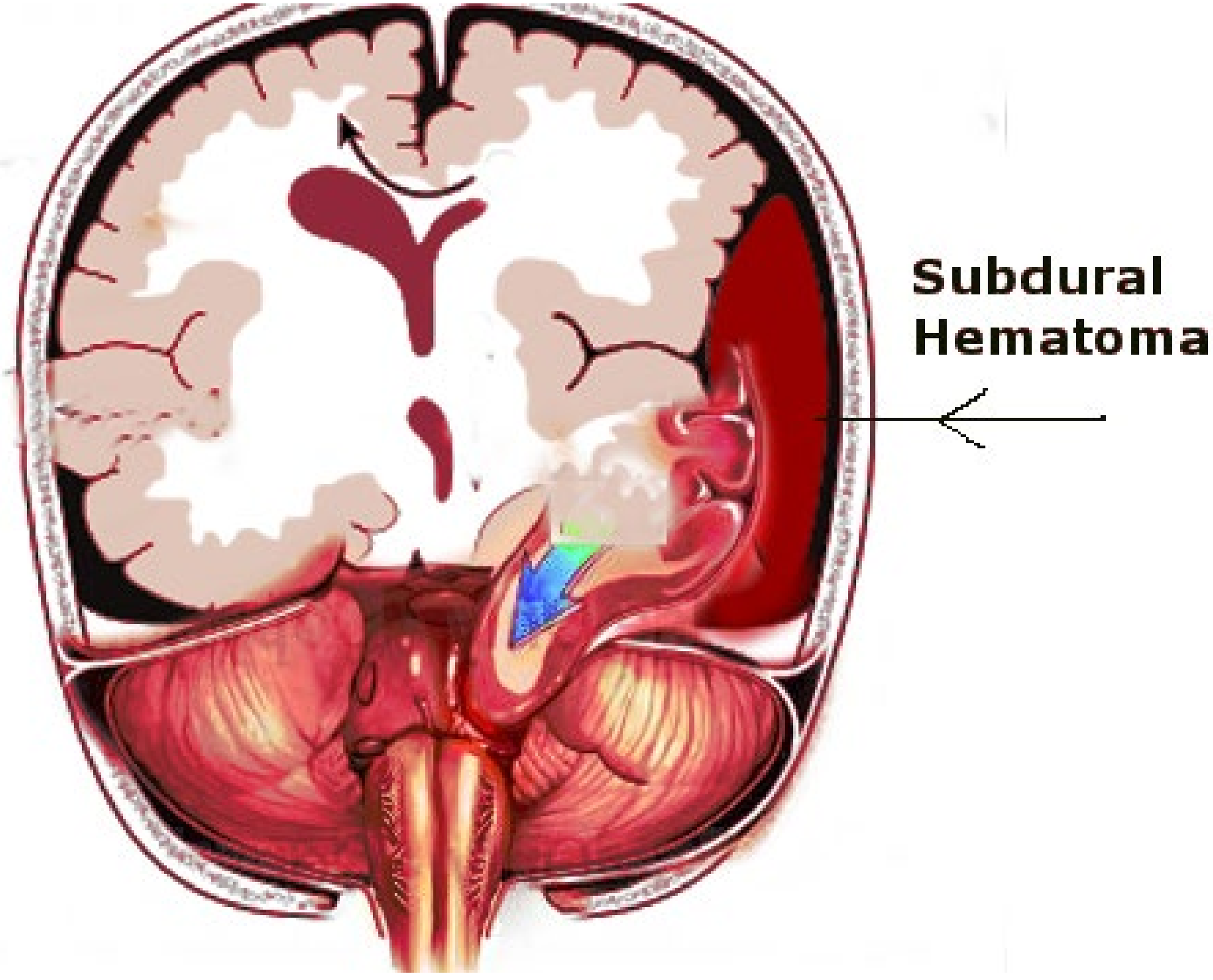
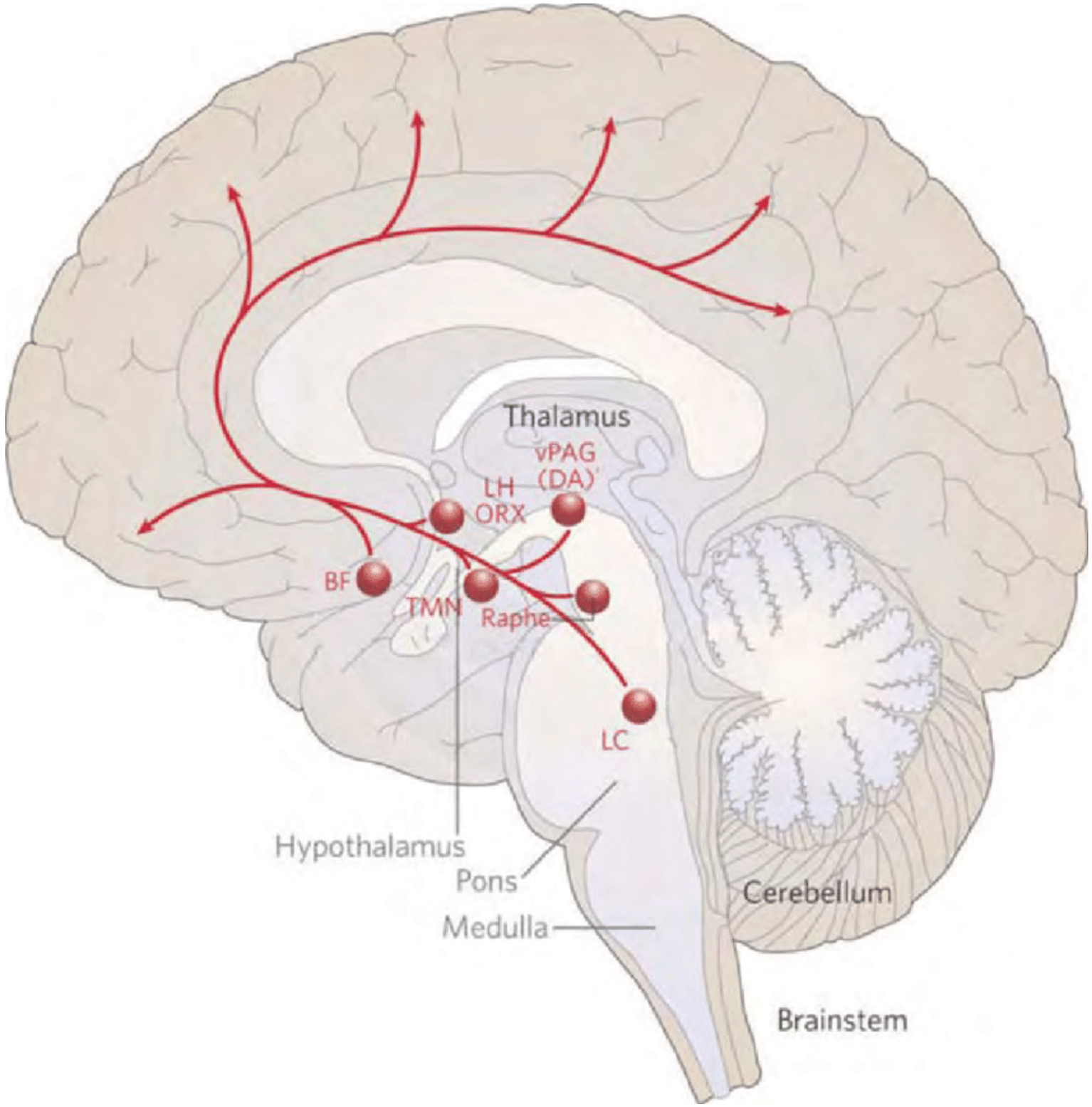


Image: S Bhimji MD, Statpearls

INSIDE THE BRAIN CAUSE OF COMA →



TY - JOUR
AU - Furlong, Teri
AU - Pascal, Carrive
AU - Phil
AU - Waite, Phil
PY - 2022/11/02
T1 - An investigation of the role of the neuropeptide hypocretin/orexin in stress

Coma = Unconscious or Unresponsive

Problem in the brain

Problem with both sides of brain

Problem with brainstem

Problem within brainstem

Problem pushing into brainstem

Problem within brainstem

- Is the patient moving?
- Make the patient move.
  - Extends arms and legs
  - Flexes arms and extends legs
  - Does not move

Problem within brainstem

Make the patient move

Extends arms and legs

Flexes arms and extends legs

Does not move

Check Eyes

- Look at the patient’s pupils.
- Then shine a light
- Check corneals.
- No C-collar? Turn the head.

Problem within brainstem

Check Eyes

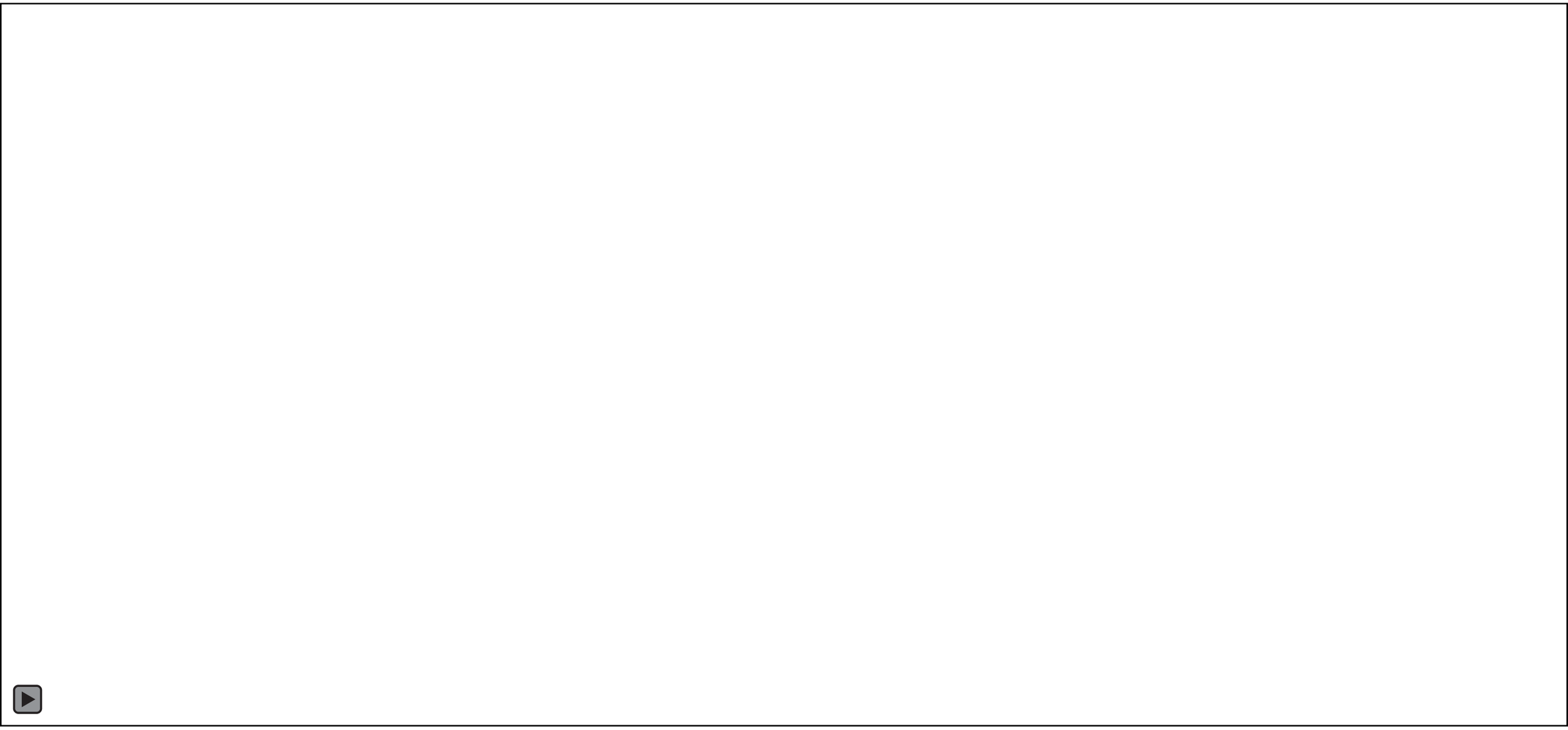
No reaction to light

Pupils of different sizes

No corneal reflex

No “Doll’s Eyes”

Penerbit USM via YouTube



Dr. Sourya Acharya (Clinical Snippets) via YouTube

- Extensor posturing
- Flexor posturing
- No movement
- Pupil doesn’t react to light
- Different size pupils
- No corneal reflex
- No “Doll’s Eyes”

↓

Head CT + CTA of head and neck

- Extensor posturing
- Flexor posturing
- No movement
- Pupil doesn't react to light
- Different size pupils
- No corneal reflex
- No "Doll's Eyes"

Problem with both sides of brain → Head CT

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Coma

Extends arms and legs

Flexes arms and extends legs

Does not move

No reaction to light

Pupils of different sizes

No corneal reflex

No “Doll’s Eyes”

None of these

Any of these

Head CT

Problem with both sides of brain

Problem with brainstem

Head CT + CTA of head and neck

Thank you!

Questions?

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