Medicolegal Review: Neuro Cases

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Disclosures

- No relevant disclosures

Agenda

- Case 1
- Case 1 Breakdown
- Case 2
- Case 2 Breakdown

Case 1

Introduction

- Medicolegal reviews
- Standard of care
- Breach of standard of care

Case Overview

EMS Note:

- 30 yo male no PMHx, no meds was driving home from work as a circus acrobat when he noticed arm weakness
- He called brother for ride home and said he was having L arm discomfort, lack of coordination in the L hand, difficulty holding a pen
- He arrived at the ED at 5:07pm

1711

ED Triage:

- T 97.6F, 45, 181/102, 18, 90% on NRB
- Moderate distress
- Assigned Level 2

“awake and alert, opens eyes spontaneously, follows commands, oriented x 3; no neurological symptoms, respiratory regular rate, depth and pattern; breath sounds clear and equal bilaterally; no shortness of breath; no cough or productive sputum”

1717

RN Note:

BIBA after leaving work due to sudden SOB, dizziness, excessive sweating, O2 sat 90% on 15L NRB, pulse 45, T 97.6F

1945

RN Note:

RN called to bedside. Pt no longer alert and oriented, snoring respirations with O2 sat 88% on 2L NC.

Pt changed to face mask

Pt suctioned, with face mask, oxygen levels up to 97%

2000

MD Note:

- Called to bedside for change in clinical status: alert, ill appearing, vomiting, coarse breath sounds
- HR 29
- Motor and sensory grossly normal bilaterally
- Had taken propranolol earlier in day
- Diaphoretic

2000

New orders for Narcan, albuterol, dexamethasone. MD at bedside.

2124

MD Note:

31 M presents with SOB and nausea, called his brother complaining of SOB, pt states he was feeling sob and difficulty managing oral secretions, +nausea, +vomiting. No cough.

PE: anxious appearing, diaphoretic

Neuro: motor and sensory grossly normal bilaterally, mild intermittent tremor

ED Diagnoses:

Mild ETOH use disorder

UGIB

Pneumonia

RN Note:

- Report received. Went in to give medications; pt was pale, diaphoretic, drooling, snoring breath sounds, 86% on 2L, HR ranging from 45-28.

- Given glucagon, albuterol, decadron

2157

MD Note:

- Patient with acute change in respiratory status likely due to PNA vs. aspiration due to vomiting and poor control of secretions

- After reviewing results with admitting, will order antibiotics and head CT for further evaluation

- Case discussed with poison control due to bradycardia in setting of propranolol use, recommends observation and supportive care as not a known large ingestion.

- ETOH level: 0. WBC WNL.

2219

RN Note:

- Pt unable to tolerate sitting flat. Pt to room for intubation.

2222

RN Note:

- Pt to ICU after CT completion

- CTs prior to ICU admission: CT chest and CT neck

Imaging:

- CXR: no acute disease
- CT chest: negative for PE, bilateral airspace opacities noted L greater than R with air bronchograms. This may represent PNA – infectious or aspiration.
- CT neck: no neck abscess noted.

Next day, 735am

MD Note:

- Neuro: eyes open, follows simple commands, able to move RUE, not moving LUE

1449

Requested read for HCT ordered at 2157 prior day

CT Head (ordered by ICU MD):

Areas of low attenuation in bilateral cerebellar hemispheres, right greater than left, compatible with infarcts. Low attenuation involving the pons, raising the possibility for additional areas of injury. Recommend brain MRI.

1526

MD note:

- NIHSS 16, no LOC questions, L arm no movement, L leg no movement, mute

- Neuro consulted

1542

Neurology consult:

- Yesterday, he was brought in for SOB, difficulty managing secretions. Brother found him with L arm discomfort and incoordination. He was intubated overnight for airway protection. Today, he was noticed to not move the left side.

- NIHSS 16

2202

MRI: loss of blood flow to most of posterior circulation

2249

Neurology consult:

- MRI shows top of basilar embolus with completed ischemic stroke in R>L brainstem and BL brainstem. Hyperdense basilar sign on non contrast CT. LSW > 24 hours, not recommending EVT

- MRA: Absent flow within bilateral VA and BA

Next day, 1637

PM&R note:

- Neuro decline, not able to move eyes, not moving R arm

Timeline of Events

1707

ED Intake

Temp: 97.6 °F (36.4 °C) 45 BP: 181/102 Resp: 18 SpO2: 90% Feeling shortness of breath DELIVERY: NRB-Non-Rebreather

1924

ED Note

Patient with difficulty managing oral secretions + nausea + vomiting - No cough

Labs: WBC 6.6

1945

Nursing Note

Patient no longer alert + SPO2: 89% DELIVERY: face mask SpO2 up - 97%

ED course: Given Ativan, albuterol, saline, zofran, gabapentin to aide in withdrawal.

Called to bedside for change in clinical status: Alert, ill appearing, vomiting Coarse breath sounds

2000

Nursing Note

Bradycardia = HR 29; PT pale, diaphoretic, drooling, snoring breath sounds, 86% on 2L, HR ranging from 45-28. DELIVERY: Given glucagon, albuterol, decadron

2157

ED Note

Patient with acute change in respiratory status likely due to PNA vs aspiration which led to intubation due to **vomiting and poor control of secretions**

After reviewing results with admitting they would **order head CT for further evaluation**

Case discussed with tox and – there was **not a known large ingestion**

CT - Head ordered

2225

PT to ICU

Patient to ICU after CT completion

CT - Chest, CT - Neck

Background

- Condition: posterior circulation stroke, basilar artery occlusion

Accepted Medical Standards

- Thrombolysis: 4.5 hours
- Thrombectomy: 24 hours

Legal

- 4 Elements of Medical Negligence:

  1. Duty of care and standard of care

  2. Breach of duty

  3. Causation

  4. Damages

Breach of Duty?

1707

ED Intake

Temp: 97.6 °F (36.4 °C) 45
BP: 181/102
Resp: 18
SpO2: 90%
Feeling shortness of breath
DELIVERY: NRB-Non-Rebreather

If the diagnosis is pneumonia, why doesn't the patient have a fever?

1924

ED Note

Patient with difficulty managing oral secretions + nausea + vomiting - No cough

Labs: WBC 6.6

Why does he have difficulty managing his secretions?

If he has pneumonia, why doesn't he have a cough?

Why is his WBC count 6.6 if he has pneumonia?

1945

Nursing Note

Patient no longer alert + SPO2: 89%
DELIVERY: face mask SpO2 up - 97%

ED course: Given Ativan, albuterol, saline, zofran, gabapentin to aide in withdrawal.

Called to bedside for change in clinical status: Alert, ill appearing, vomiting
Coarse breath sounds

2000

Nursing Note

Bradycardia = HR 29; PT pale, diaphoretic, drooling, snoring breath sounds, 86% on 2L, HR ranging from 45-28. DELIVERY: Given glucagon, albuterol, decadron

What is the explanation for his bradycardia?

Why is he drooling?

2157

ED Note

Patient with acute change in respiratory status likely due to PNA vs aspiration which led to intubation due to **vomiting and poor control of secretions**

After reviewing results with admitting they would **order head CT for further evaluation**

Case discussed with tox and – there was **not a known large ingestion**
CT - Head ordered

How does pneumonia vs. aspiration explain vomiting and poor control of secretions?

Why is admitting telling you to order a head CT?

2225

PT to ICU

Patient to ICU after CT completion

CT - Chest, CT - Neck

Why wasn't a CT head ever done in the Emergency Department?

Outcome:

Settled

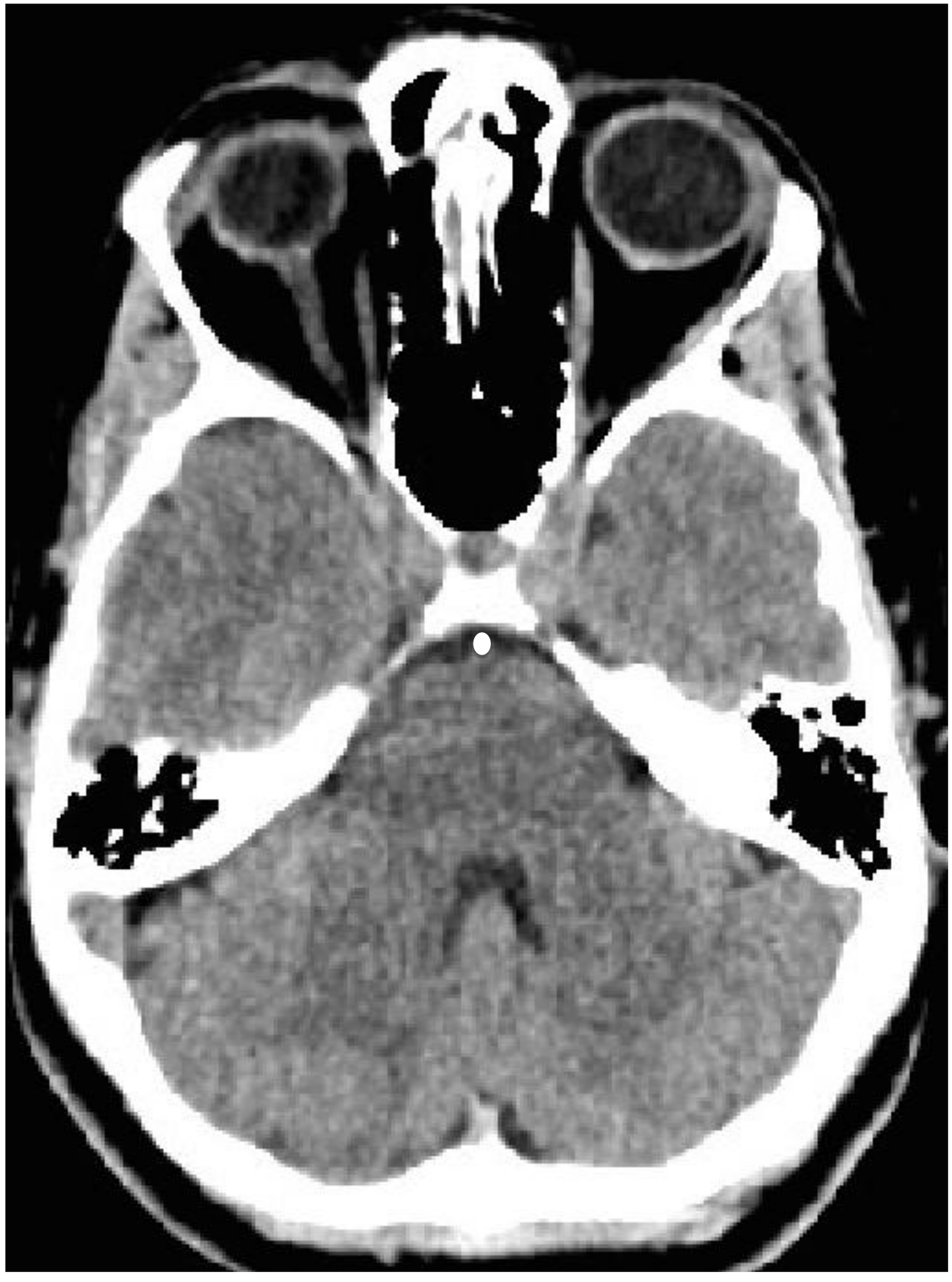
Conclusion

- Key takeaways:
  - Read the EMS note
  - Beware writing a diagnosis in your medical note without evidence of such
  - Posterior circulation stroke ≠ anterior circulation stroke

Vertebral Artery Dissection

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

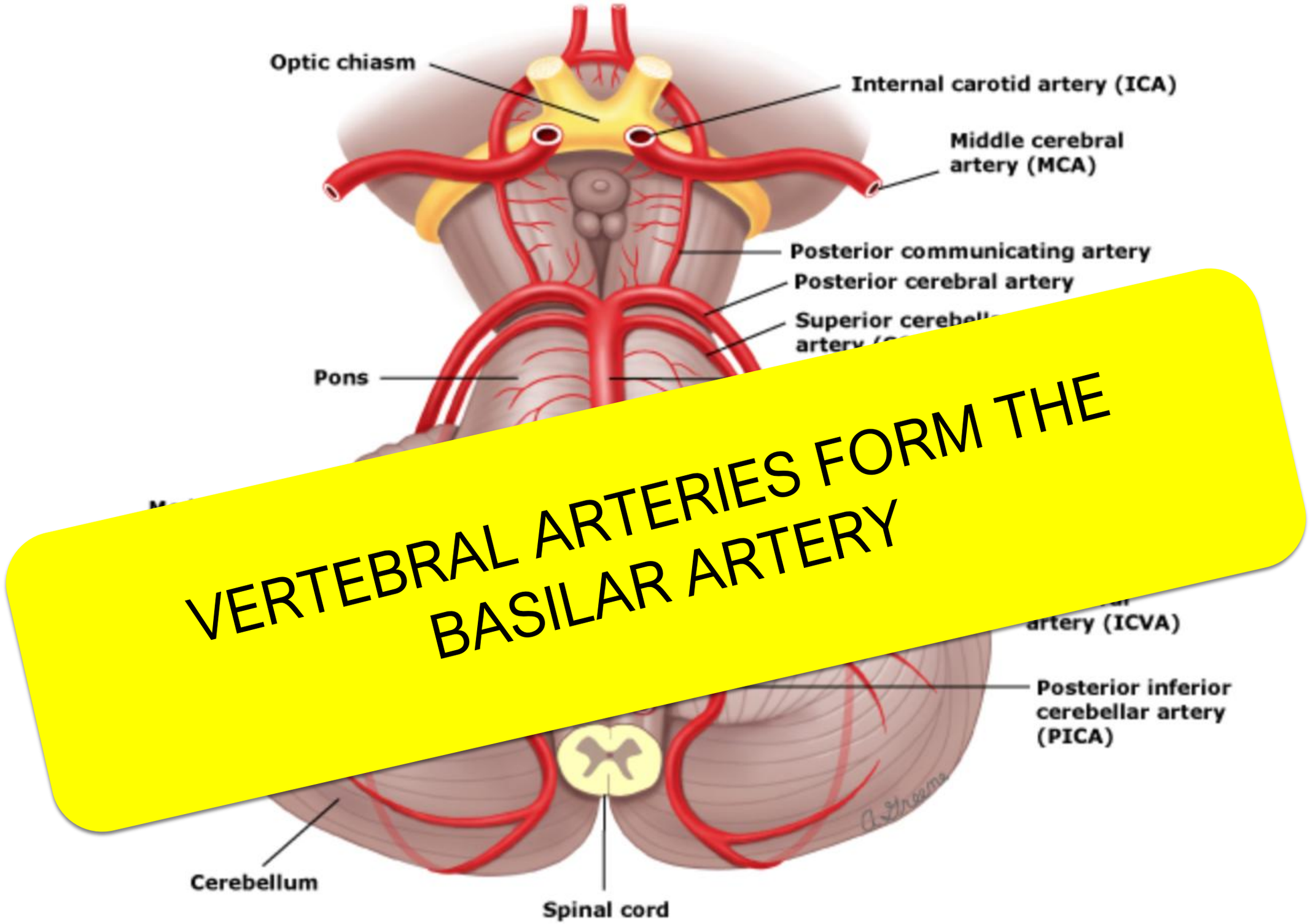
Arnold M, Bousser MG, Fahrni G, et al. Vertebral artery dissection: presenting findings and predictors of outcome. Stroke. 2006;37(10):2499-2503. doi:10.1161/01.STR.0000240493.88473.39.



Basilar Artery Occlusion

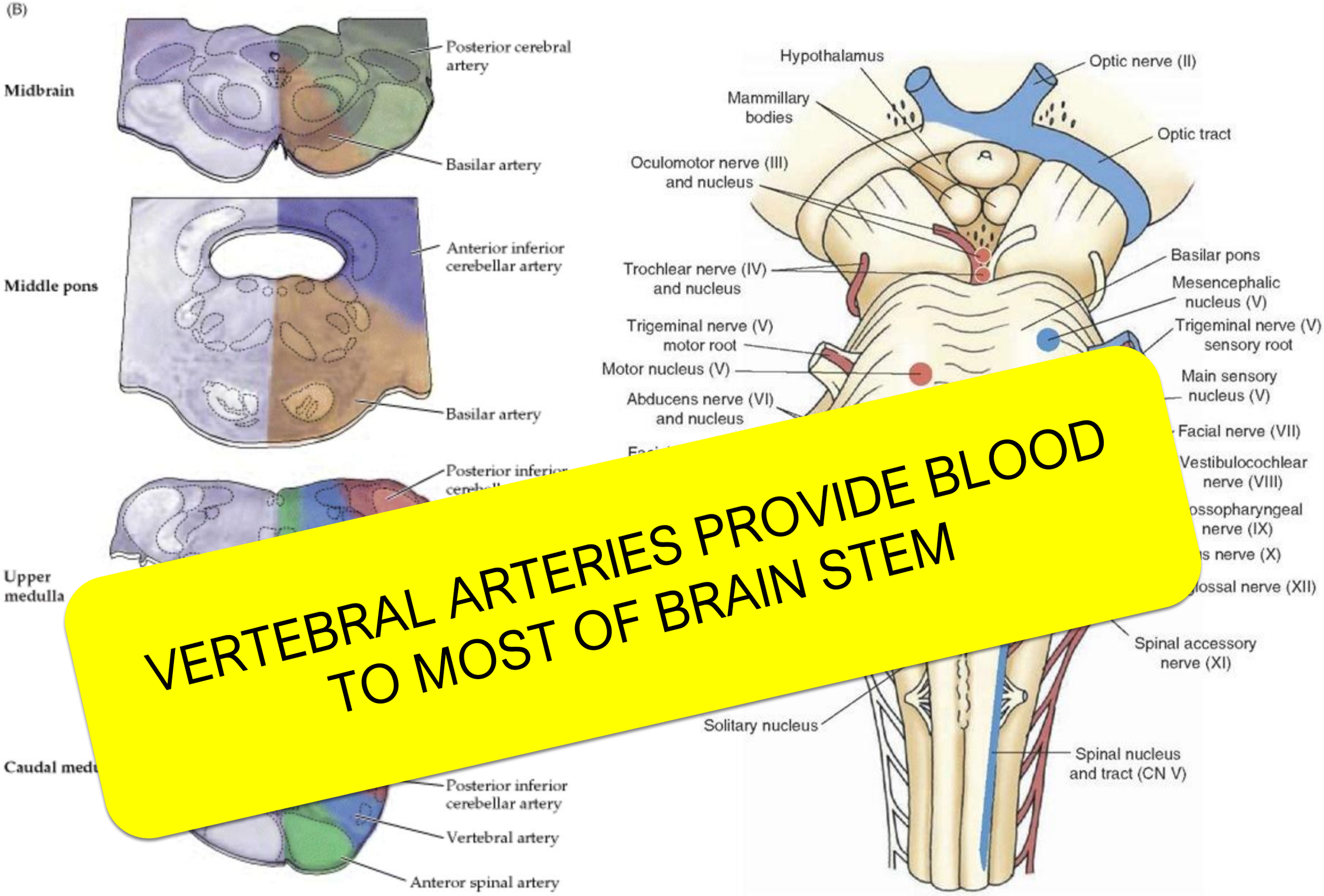
- 2 landmark studies in NEJM: ATTENTION and BOACHE

- Good chance of achieving favorable outcome if they treated with thrombectomy – favorable outcome in 46% vs. 24% of medically treated



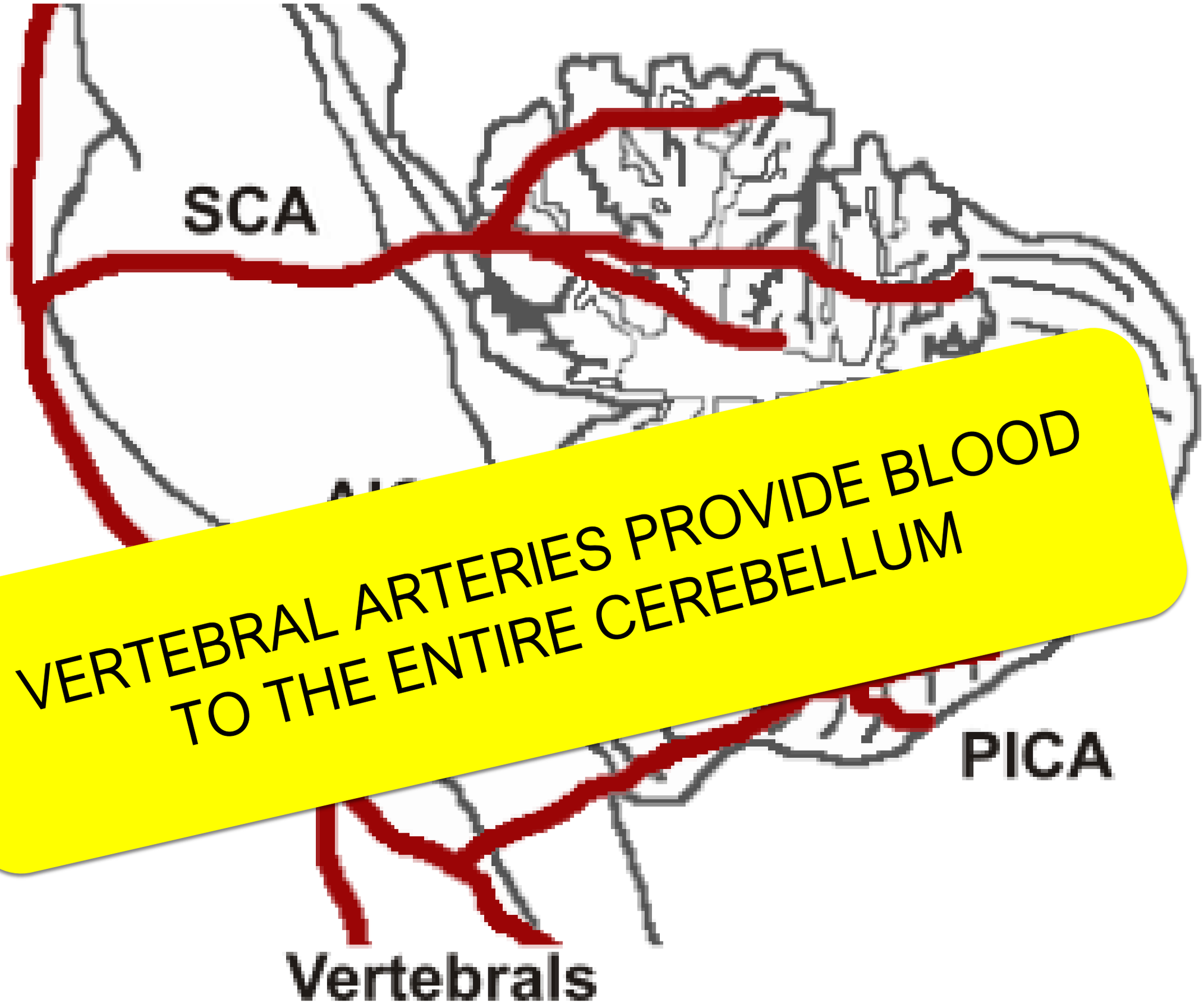
VERTEBRAL ARTERIES FORM THE BASILAR ARTERY

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

Case 2

Introduction

Context: asked to assess emergency department workup of a stroke

Legal

- 4 Elements of Medical Negligence:

  1. Duty of care and standard of care

  2. Breach of duty

  3. Causation

  4. Damages

Case Overview

1847

RN Note:

- EMS stroke alert at 1840
- ED Level of visit: 5
- CC: dizzy, nausea and vomiting, numbness, slurred speech
- Last known well time: 1800
- BP 180/119, RR 18, SpO2 98%

1851

Stroke Alert canceled

1856

Delay in CT imaging due to ED crowding and patient was vomiting so sent back from CT.

1940

RN Note:

Pt laying in bed nausea and actively vomiting. MD made aware. Hypertensive on monitor. Pt laying with eyes closed, does seem to have slurred speech to me

2000

Vitals:

BP 210/112, RR 25, SpO2 93%

2130

MD Note:

30 yo F in ED for dizziness and vomiting. Per EMS, has had prior stroke and stroke presented with vomiting. No residual sx. LSW 3 hours ago, endorsing dizziness, vomiting, full body numbness all over arms and legs. Denies substance use. Denies ripping back pain, chest pain. Has h/o HTN but not on meds. Non smoker.

Exam: AF, BP 210/112, 93% on RA

Speech slowed, no facial droop, numbness to face and arms but no focal abnormalities.

NIHSS: R arm 0, L arm 0, R leg 0, sensory: 1 (mild to moderate sensory loss)

A/P: NIHSS 1, activated code stroke, thrombolytic not given because symptoms have resolved or are significantly improved, uncontrolled HTN. Diagnosis: dizziness, vomiting, hypertensive urgency

2156

NCHCT:

- No evidence of acute intracranial hemorrhage
- R occipital encephalomalacia due to prior infarction

0032

Started on labetalol gtt

0300

MD Note:

- Called to patient room, right eye won’t look past midline, decreased sensation L side of body, dysmetria b/l, no pronator drift, no facial droop

- Arrived in ED with SBP 220s, started on labetalol gtt

NIHSS:

- 1b: 1 – answers one question correctly
- 2: 1 – partial gaze palsy
- 3: 1 – partial hemianopia
- 7: 2 – limb ataxia present in 2 limbs
- 8 – 1: mild to moderate sensory loss
- **Total score = 6**

0329

Code stroke activated. CT angiogram and CT perfusion. No thrombolytic given due to onset > 4.5 hours.

0357

MD Note:

- Not alert, partial gaze palsy, partial hemianopia, minor facial paralysis L side, L arm drift, L leg drift, limb ataxia in both limbs, mild-moderate sensory loss, mild-moderate dysarthria, NIHSS 10

0402

CT head perfusion and CT angiogram: thrombus in R superior cerebellar artery

0410

RN Note:

Patient with decreased attentiveness, will open eyes to voice, has weakness in LUE

0429

Pt admitted to floor with nausea, vomiting, and dizziness with no admission diagnosis.

Required emergent sub-occipital craniectomy for cerebellar infarction

Timeline of Events

1840

EMS Stroke Alert

1847

ED RN Triage

CC: dizziness, nausea, vomiting, numbness, slurred speech

LSW: 1800

1851

Cancel Stroke Alert

1852

MD lab & CT orders

1856

CT

Patient went for CT but sent back due to vomiting

1940

RN Note

Patient with nausea and vomiting. MD made aware. Pt with slurred speech.

2130

MD Note

LSW 3 hours ago, NIHSS 1:

R arm: 0
L arm: 0
R leg: 0
Sensory: 1

Thrombolytic not given because sx resolved or improved

Timeline of Events

2156

NCHCT

0032

Labetalol gtt

0300

Stroke Alert activated

Patient can’t move eyes, b/l dysmetria, NIHSS 6

0357

NIHSS 10

Patient with decreased attention, LUE weakness, NIHSS 10

0402

CTA head CT perfusion

Right superior cerebellar artery stroke

Emergent Suboccipital Craniectomy

Medical Standards

- Thrombolysis: 4.5 hours
- Thrombectomy: 24 hours

Breach of Duty?

1840

EMS Stroke Alert

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2130

MD Note

LSW 3 hours ago, NIHSS 1:

R arm: 0
L arm: 0
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Sensory: 1

Thrombolytic not given because sx resolved or improved

Breach of Duty?

2156	0032	0300	0357	0402	
CT	Labetalol gtt	Stroke Alert activated Patient can’t move eyes, b/l dysmetria, NIHSS 6	NIHSS 10 Patient with decreased attention, LUE weakness, NIHSS 10	CTA head CT perfusion Right superior cerebellar artery stroke	Emergent Suboccipital Craniectomy

Outcome:

Pending

Conclusion

- Key takeaways:
  - Be very careful canceling a stroke alert
  - Be aware of RN notes & concerns
  - If you suspect stroke, follow it through, do a full NIHSS

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% missing neuro exam with elements of NIHSS, compared with 8% of the accurately diagnosed strokes (P<0.001).

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 complaints: headache, nausea/vomiting, dizziness, seizure, syncope, and difficulty walking
- Nausea, vomiting, dizziness: greater odds of missed stroke

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

- **>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.

Final Conclusions

Missed Strokes:

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

Thank you!

Questions?

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