Intracerebral Hemorrhage

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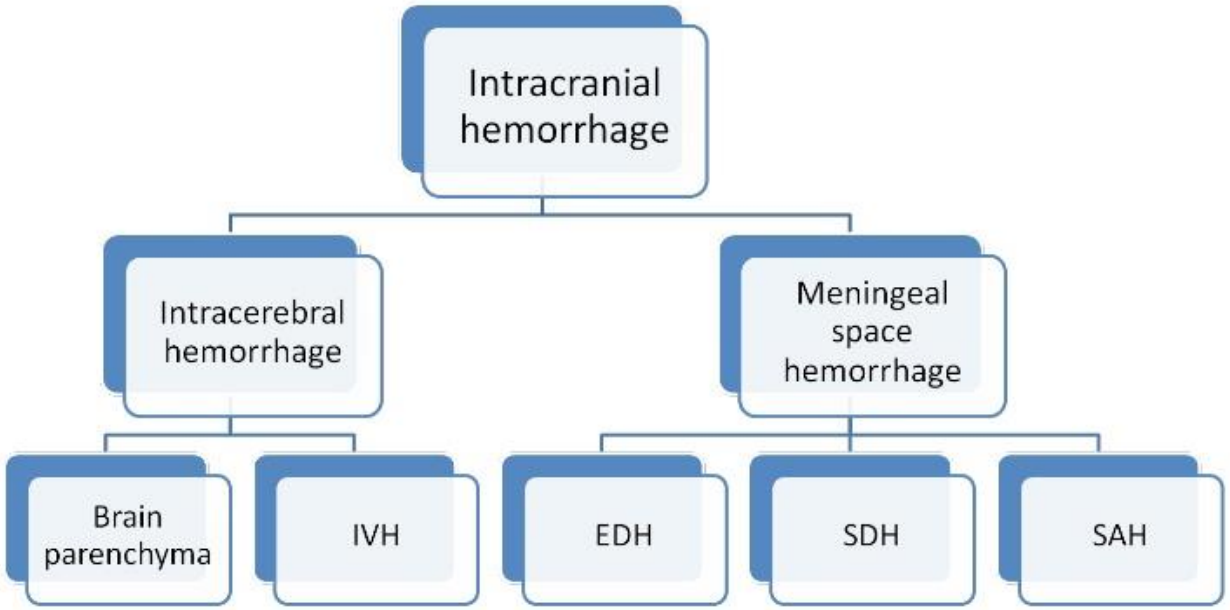
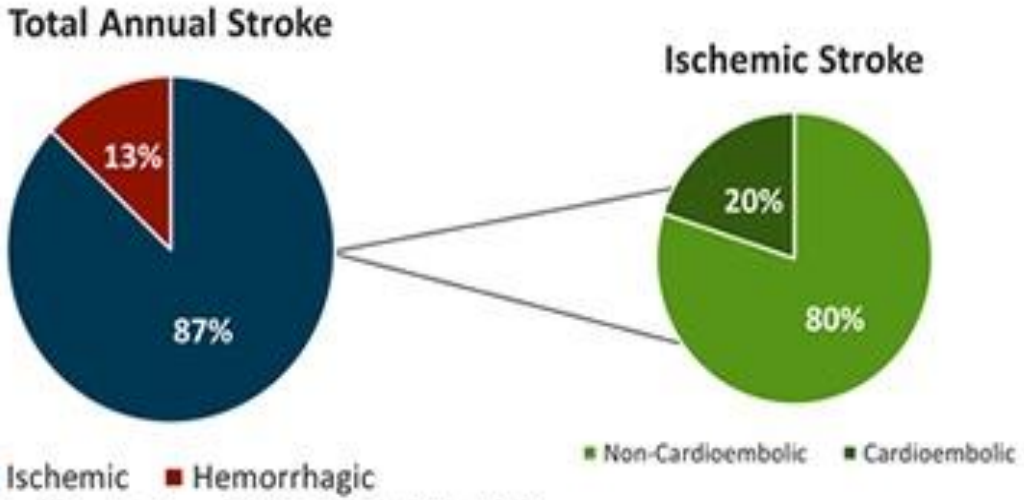
Introduction



Types of Stroke
US Distribution

US total stroke annually 800,000

- US ischemic stroke approximately 87% of these are ischemic, 13% are hemorrhagic
  - Of those 87% that are ischemic, about 80% of those are non-cardioembolic



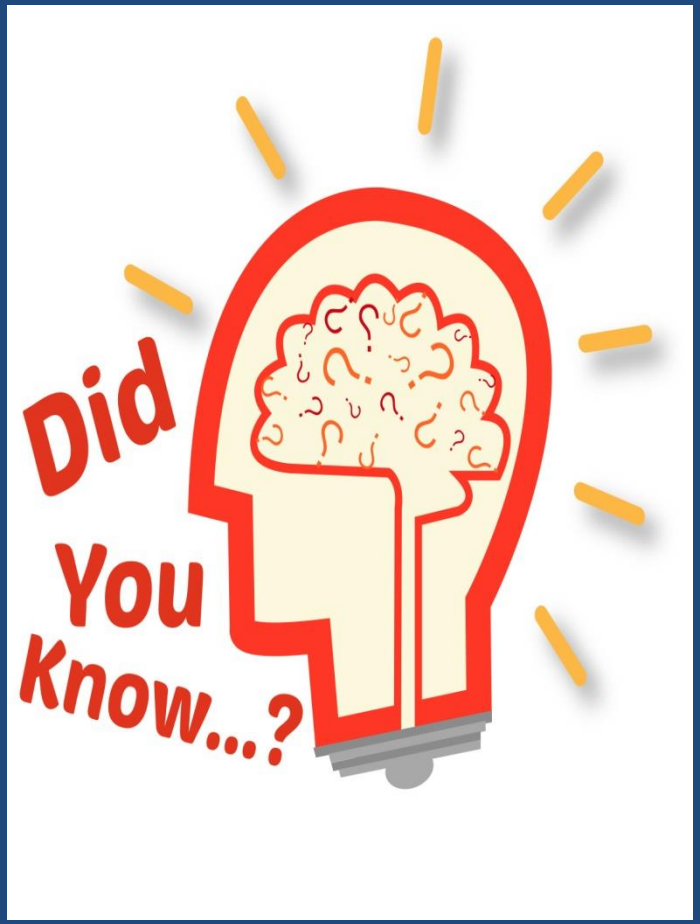
Mozaffarian D, et al. *Circulation*. 2016;133:e38-e360.

Epidemiology

- Asian countries have a higher incidence of intracerebral hemorrhage than other regions of the world.
- A higher incidence of intracerebral hemorrhage has been noted in Chinese, Japanese, and other Asian populations, possibly due to environmental factors (eg, a diet rich in fish oils) and/or genetic factors.

Mortality and Disability

- Overall, 40% mortality at 1 month and 54% at one year
- Only 12-40% are functionally independent long term
- 2010 – 62.8 million lost DALYs with ICH compared to 39.4 million in ischemic stroke



Epidemiology

- Annually, more than 20,000 individuals in the United States die of intracerebral hemorrhage.
- Intracerebral hemorrhage has a 30-day mortality rate of 44%.
- Pontine or other brainstem intracerebral hemorrhage has a mortality rate of 75% at 24 hours.
- Incidence of intracerebral hemorrhage increases in individuals older than 55 years and doubles with each decade until age 80

Risk Factors

- HTN
- Excessive ETOH use
- Smoking
- Age
- Ethnicity/Race
- Medications
- Sympathomimetics

Etiology

- Hypertensive ICH
  - Essential
  - Eclampsia
- Non-hypertensive ICH
  - Vascular malformation: AVM, Aneurysm, Cavernous hemangioma
  - Bleeding disorders/anticoagulant
  - Amyloid angiopathy
  - Trauma
  - Tumor
  - Drug abuse: amphetamine, cocaine, PPA

Pathophysiology

- Primary immediate effect
  - Hemorrhage growth
  - Increase ICP
- Secondary effect
  - Downstream effect
  - Edema
  - Ischemia

- basal ganglia (40-50%),
- lobar regions (20-50%),
- thalamus (10-15%),
- pons (5-12%),
- cerebellum (5-10%),
- other brainstem sites (1-5%).

Clinical presentation

- Alteration in level of consciousness (approximately 50%)
- Nausea and vomiting (approximately 40-50%)
- Headache (approximately 40%)
- Seizures[3] (approximately 6-7%)
- Focal neurological deficits

Focal neurological deficits

- Putamen - Contralateral hemiparesis, contralateral sensory loss, contralateral conjugate gaze paresis, homonymous hemianopia, aphasia, neglect, or apraxia
- Thalamus - Contralateral sensory loss, contralateral hemiparesis, gaze paresis, homonymous hemianopia, miosis, aphasia, or confusion

Focal neurological deficits

- Lobar - Contralateral hemiparesis or sensory loss, contralateral conjugate gaze paresis, homonymous hemianopia, abulia, aphasia, neglect, or apraxia
- Caudate nucleus - Contralateral hemiparesis, contralateral conjugate gaze paresis, or confusion

Investigation

- Laboratory studies
  - CBC
  - Coagulogram
  - Electrolyte
  - others
- Imaging
  - CT brain w/o contrast

CT-brain

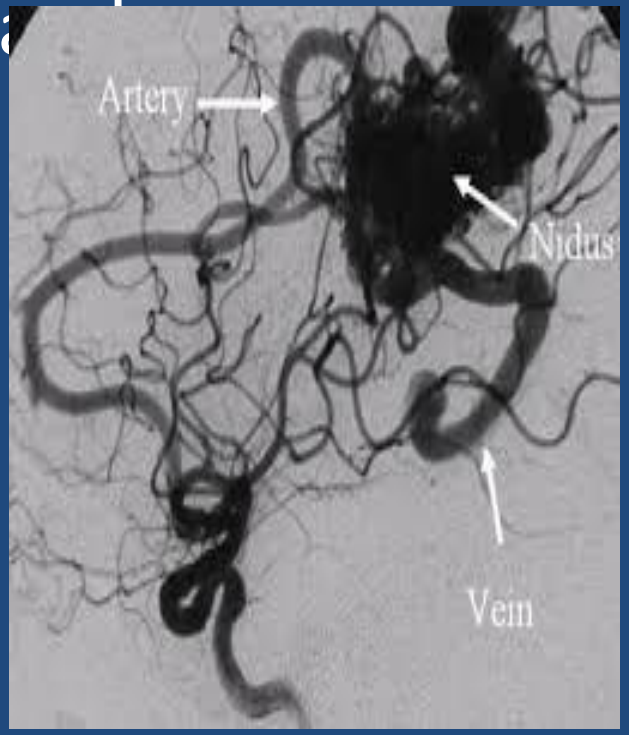
- demonstrates acute hemorrhage as hyperdense signal intensity
- Multifocal hemorrhages at the frontal, temporal, or occipital poles suggest a traumatic etiology.
- Hematoma volume can be approximated by (A x B x C)/2
- Iodinated contrast may be injected to increase screening yield for underlying tumor or vascular malformation.

The Workup…

- CT head – no contrast
- CTA head/neck – suspect vascular etio
  - Careful interpreting noncon CT head after CTA
- MRI brain – with gado if looking for neoplasm
- MRA/MRV - if allergic to CT dye or if looking at venous outflow
- Cerebral angiography

Other Causes

- AVM, aneurysms, and other vascular malformations (venous a
  angiomas)
- CVT
- Intracranial neoplasm
- Amyloid angiopathy
- Moya Moya



Vessel imaging

- CT angiography permits screening of large and medium-sized vessels for AVMs, vasculitis, and other arteriopathies.

The Workup…

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- Cerebral angiography

What to do?????

- Control BP!!!!
  - Guidelines – reduction of SBP to 140
    - Anderson/Qureshi studies – Interact 2 and AIACH 2
      - Not clear if SBP > 220
    - Use labetalol and/or nicardipine drip to titrate blood pressure
- Between 15-23% of patients > hematoma expansion in first few hours
- A word about penumbra

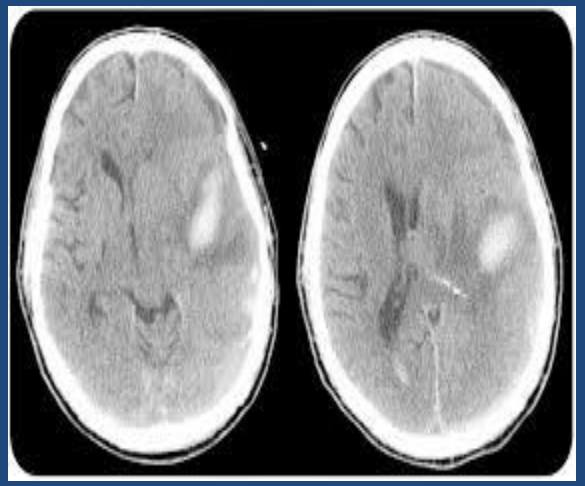
What do we do??

- EBP nursing care
  - Watch for neuro decline
  - Type and cross with your labs!
  - HOB > 30
  - Head midline
  - Prevent vagal maneuvers
  - Control SBP
  - Treat hyperglycemia
  - Treat hyperthermia
  - Seizure prophylaxis
  - DVT prophylaxis

- Typically, do not make patients DNR within the first 48 hours

Cerebral Edema: Sodium and CO2

- Use the ventilator to manage CO2



- Get the sodium up
- Mannitol/3% or even 23.4% (requires central line) for herniation

Surgery anyone????

- EVD
  - CLEAR III trial – no outcome benefit with ve tPA
- Craniotomy
  - Depends on etiology
  - **Depends on AC/APT status
  - Depends on timing
  - Depends on location
    - STICH II – no overall favorable ou
    - MISTIE II – MIS techniques
    - MISTIE III – underway
  - Cerebellar ICH

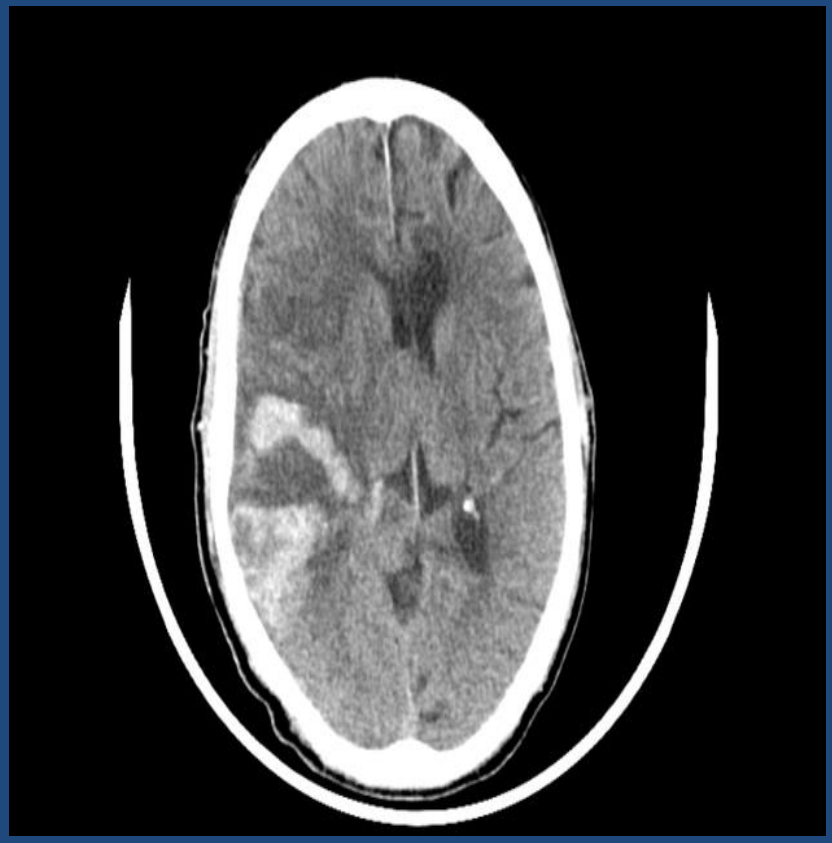
Subarachnoid Hemorrhage

- Usually due to aneurysm rupture
- Can be perimesencephalic SAH

- Coil/Clip
- NIMOTOP/NIMODIPINE
- Strict BP control
- Hydrocephalus
- Vasospasm
- Sodium
- Urine output

Hemorrhagic Transformation
HI 1/2 – PH 1/2

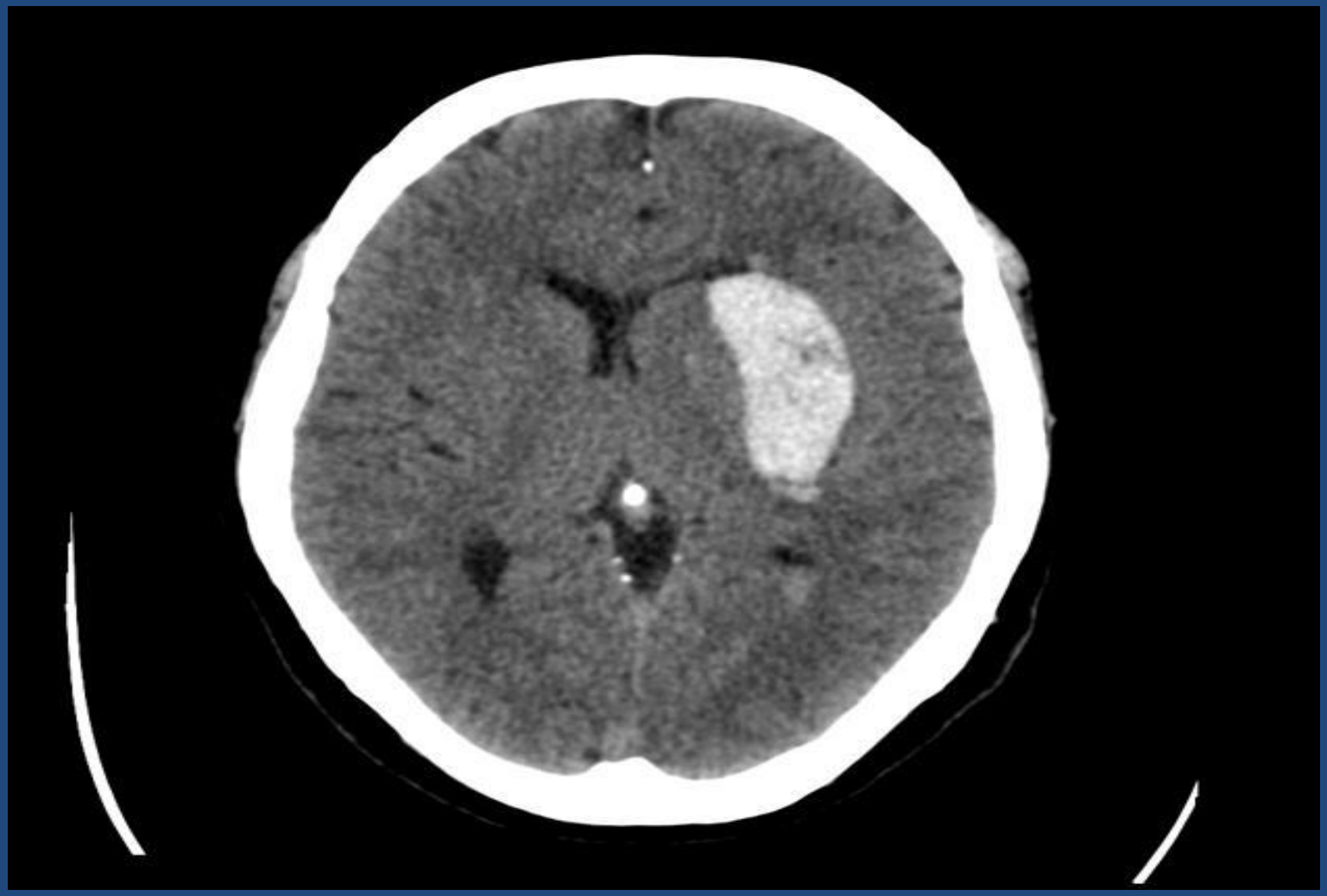
- > 50% have some hemorrhage
  - 0.6%-3% >> untreated patients
  - 6% in treated patients
- Risk Factors
  - Older age
  - larger stroke size
  - cardioembolic stroke etiology[1]
  - anticoagulant use
  - fever
  - hyperglycemia
  - low serum cholesterol
  - Acutely elevated systolic blood pressure
  - thrombolytic therapy/recanalization
- Treatment



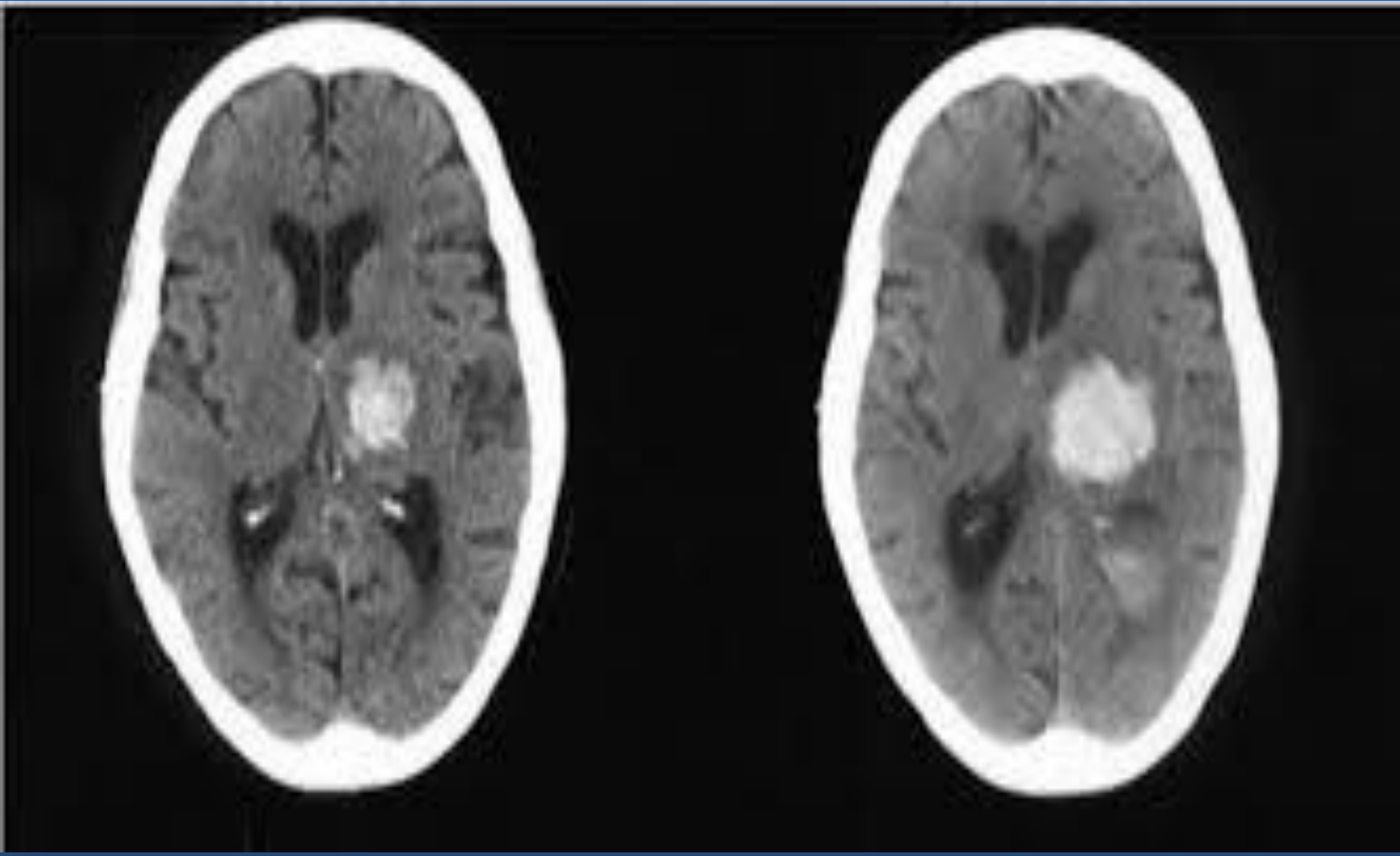
Hypertensive hemorrhage

- Putamen
- Thalami
- Pontine
- Cerebellum
- Lobar

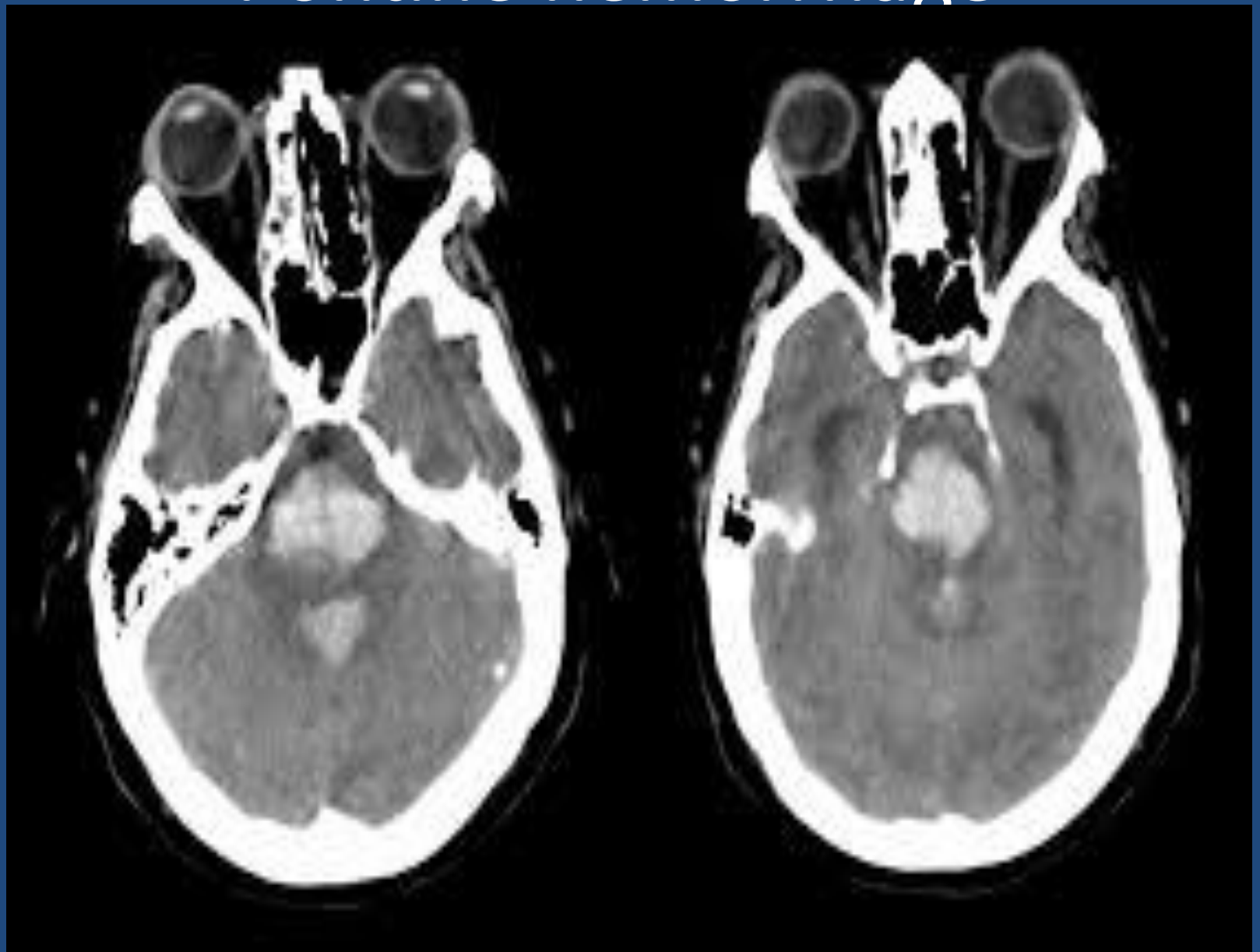
Putamen Hemorrhage



Thalamic hemorrhage

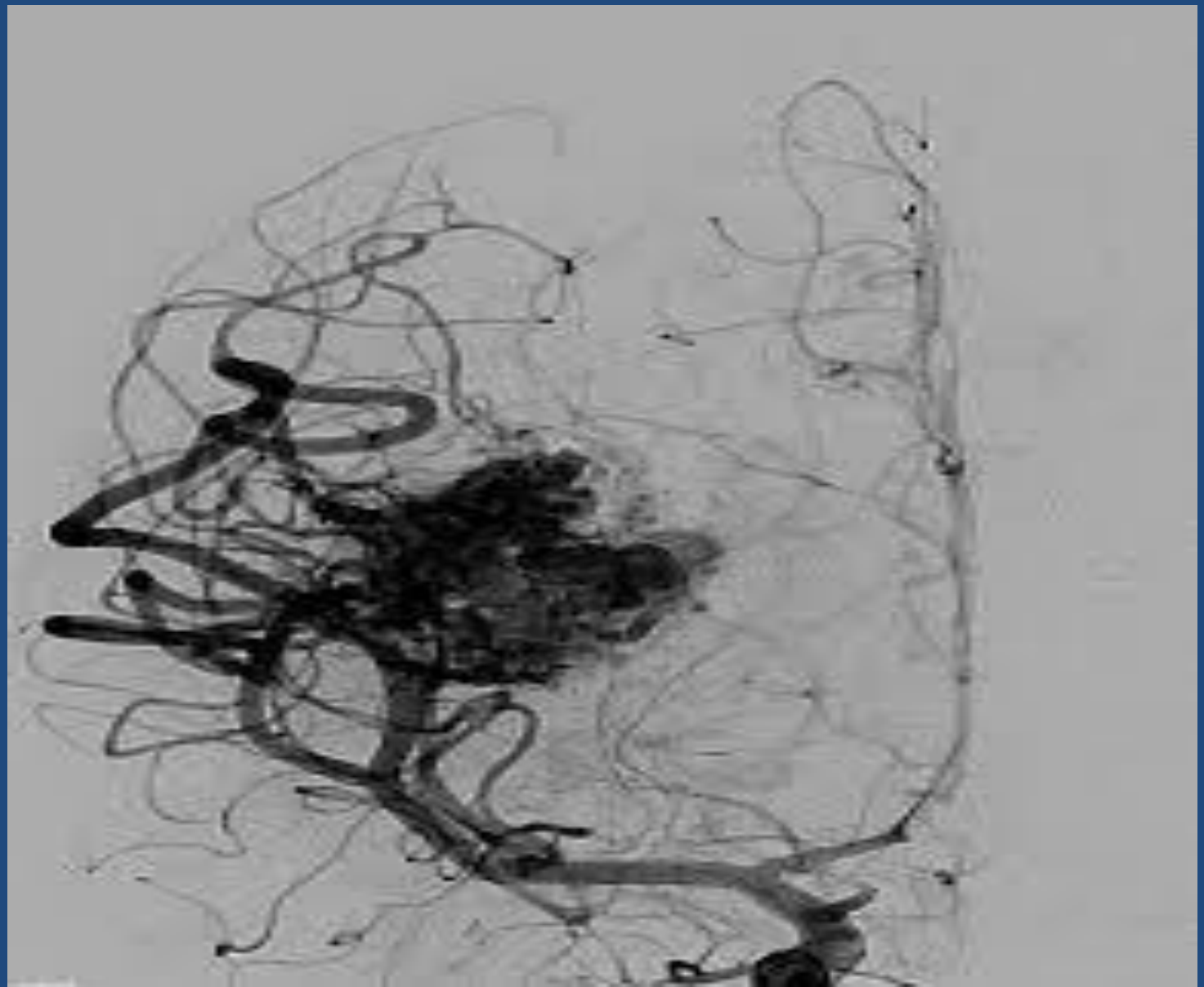


Pontine hemorrhage

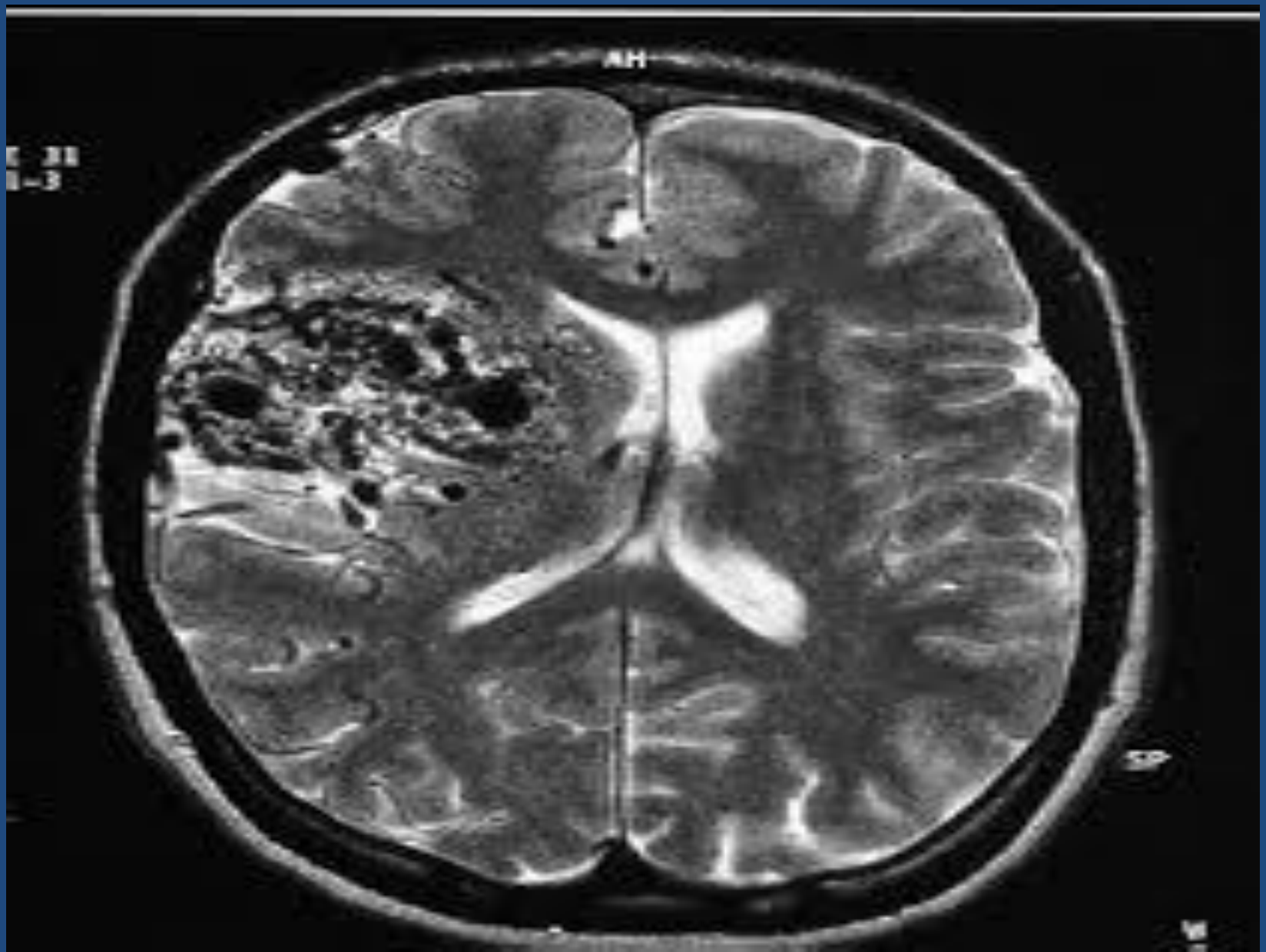


Cerebellar hemorrhage

AVM

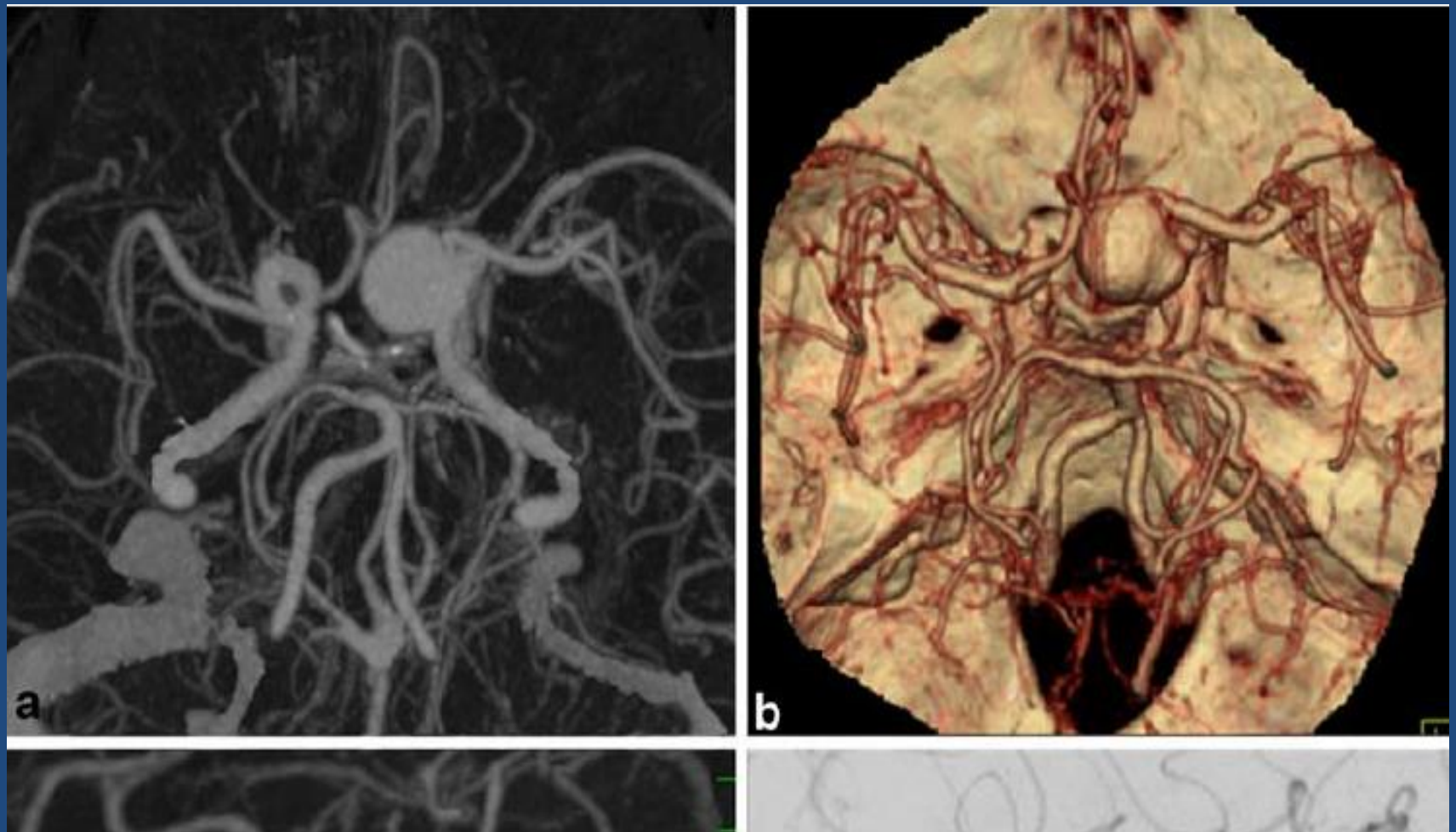


AVM

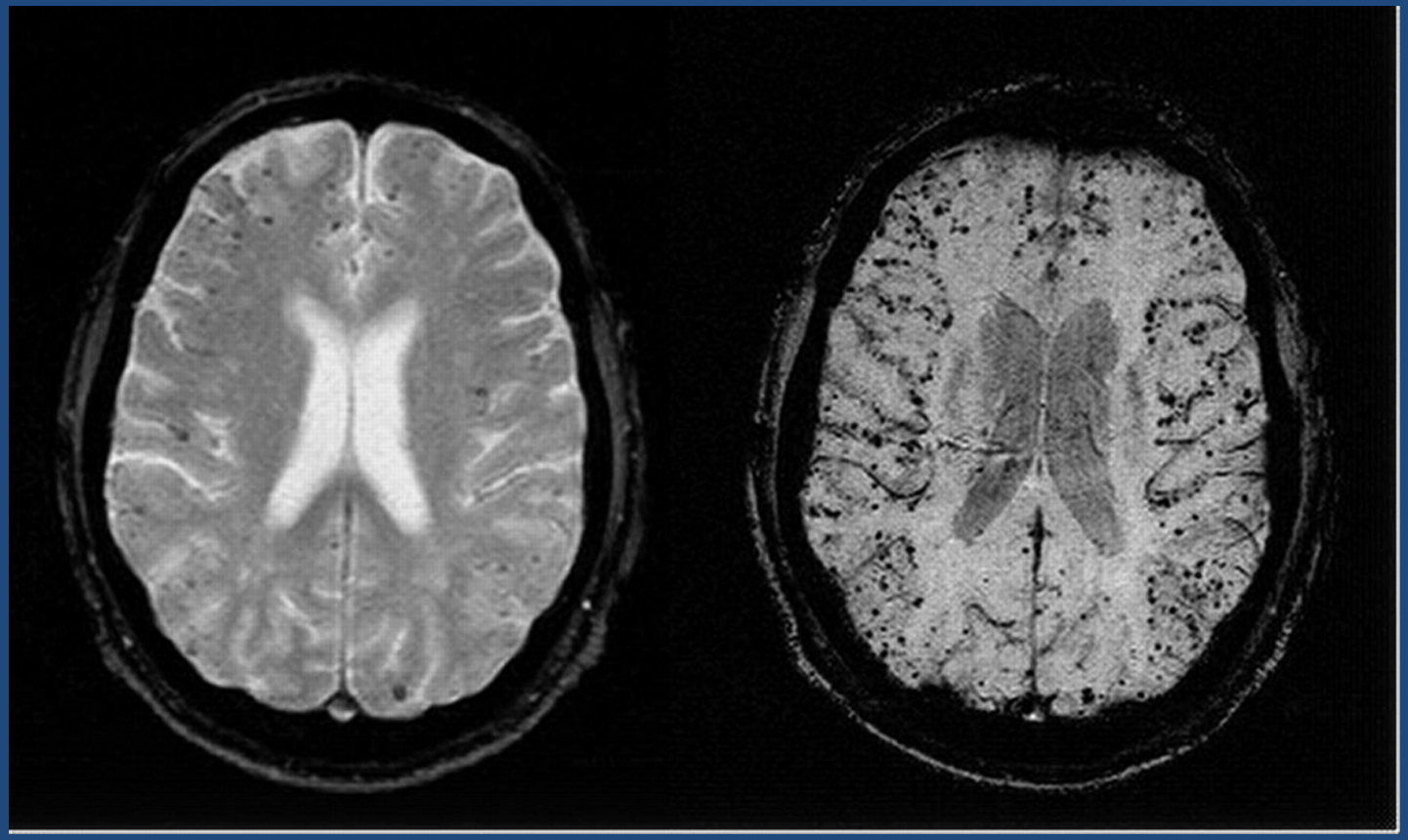


SAH

Aneurysm

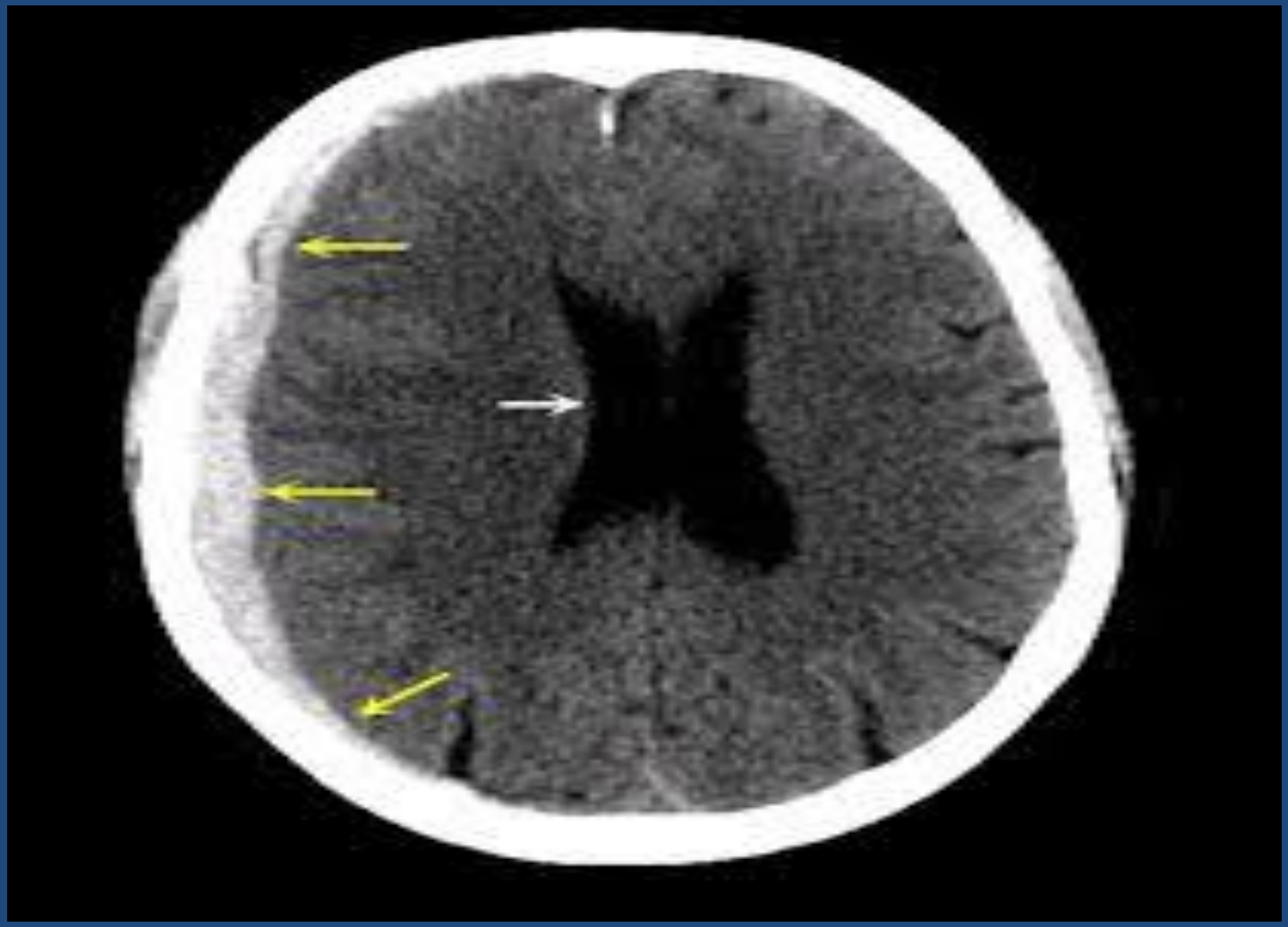


Amyloid Angiopathy



EDH

SDH



Lobar hemorhage

Tumor with ICH