SUBARACHNOID HEMORRHAGE

by Delal Maitah
&
Ghadi Alqade

DEFINITION

condition characterized by bleeding into the subarachnoid space, which is the area between the arachnoid and the pia mater. It's often caused by the rupture of an aneurysm or a head injury.

CAUSES

- Most common cause: **Trauma**
- Spontaneous causes:
  - Ruptured Aneurysms
  - Arteriovenous Malformations (AVMs)
  - Tumor
  - Vasculitis / Carotid Dissection
  - Hypertension
  - Use of Anticoagulants
  - Idiopathic Causes

SOME FACTS

Annual rate: 10-28/100,000

- 10-15% die before reaching the hospital.
- Among survival, rebleeding is the primary cause of M&M risk.
- 7% will die from vasospasm.
- Another 7% will have a severe deficit due to vasospasm.

Overall, one-third will have a good prognosis

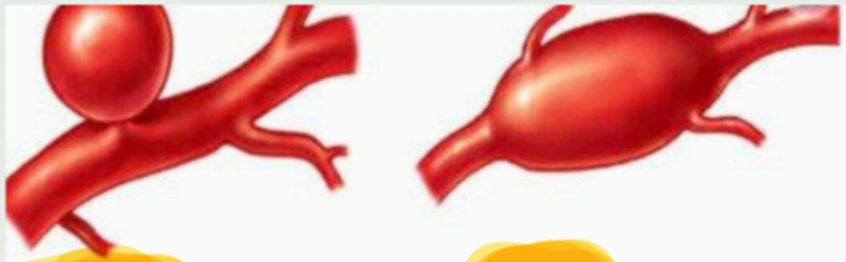
- 85-95% of aneurysms occur in the ICA
- 5-15% in the posterior circulation
- 20% of aneurysm patients have multiple aneurysms.

BERRY ANEURYSM

- known as a **saccular aneurysm** is the most common type of aneurysm.
- appears at the base of the brain, where the **Circle of Willis** is.
- **Peak age: 55-65 years**, and occurs in **females** more than males, 3:2
- 30% of aneurysmal SAH **occurs during sleep**

BERRY ANEURYSM

- 30-50% of patients **have warning symptoms 1-3 weeks before SAH**
- SAH complicated with ICH 20-40%, IVH 15-35%
- 50-60% have a 30-day mortality rate
- 60% of those who **survive the initial bleed** have a **6-month mortality rate**

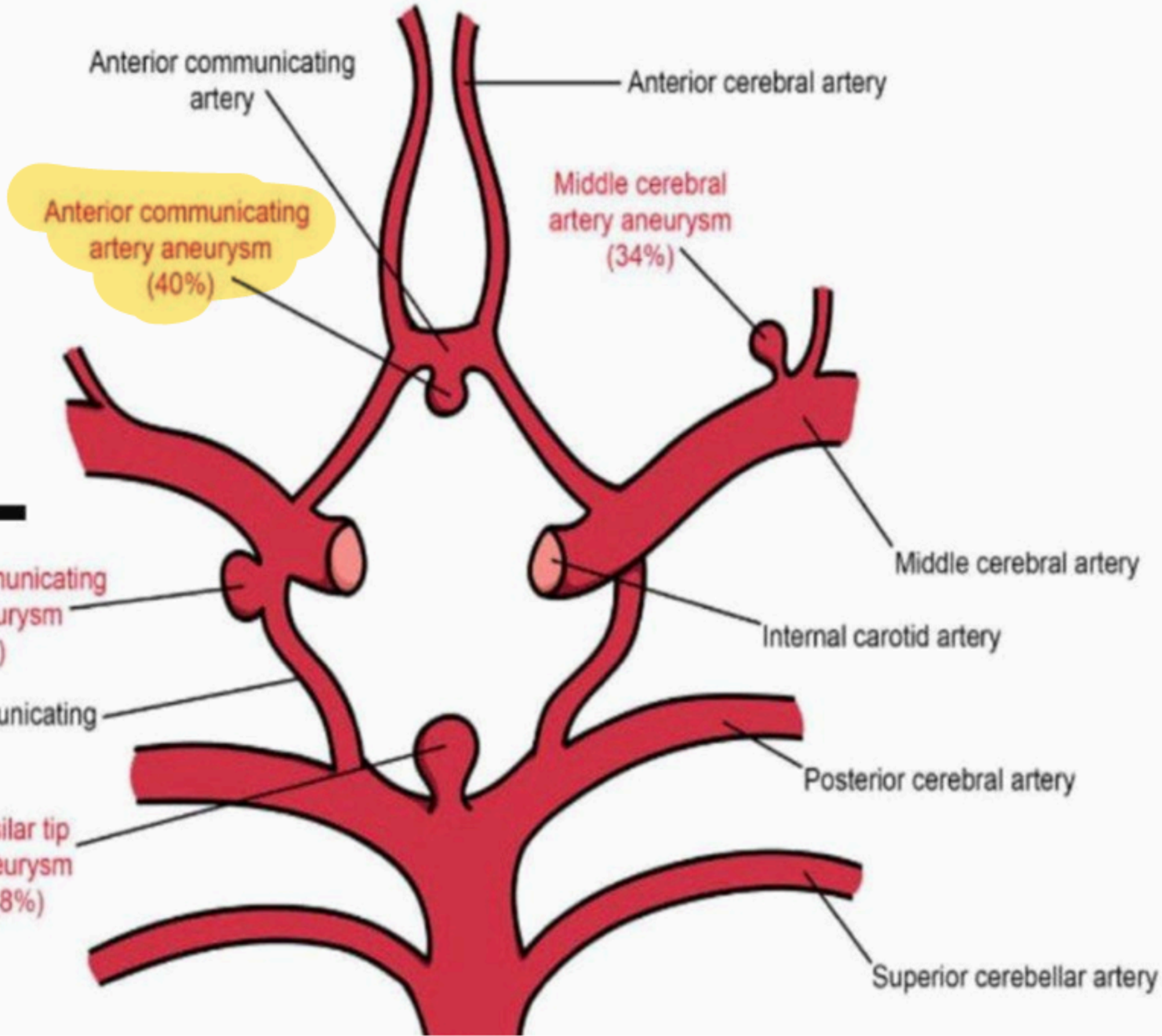


Saccular Aneurysm

Fusiform Aneurysm

Ruptured Aneursym

Saccular (Berry) Aneuryms of the Circle of Willis



ETIOLOGY

- Congenital predisposition due to defects in the arterial wall
- Atherosclerosis
- HTN is the most implicated factor for initiation, growth, and subsequent rupture
- Infectious: most common S. Aureus
- Genetics in PCK, Marfan's syndrome, EDS
    - Dissecting Aneurysms looks like a Berry aneurysm, but it's not a cause for Berry aneurysm

RISK FACTORS

- HTN
- SMOKING
- ALCOHOL CONSUMPTION
- CAFFEINE CONSUMPTION
- OCP
- DRUG ABUSE
- DIURNAL VARIATION IN BLOOD PRESSURE

CLINICAL FEATURES

- Sudden onset of severe headache
- vomiting and/or LOC
- Frontal cranial nerve deficits
- Bach pain
- Nuchal rigidity, Kernig's sign, Brudzinski's sign
- Sentinel haemorrhage causes warning headache

NATURAL HISTORY OF RUPTURED ANEURYSM

- 15% of patients die before reaching the hospital.
- Another 15% **die within the first 24 hours** of hospitalization, often **due to complications** like **rebleeding or increased intracranial pressure.**
- An additional 15% **die between 1 and 14 days** after the rupture, as a result of **vasospasm or delayed rebleeding.**

NATURAL HISTORY OF RUPTURED ANEURYSM

- 15% **die between 2 and 8 weeks post-rupture**, due to **ongoing neurological complications**.
- A further 15% may **die between 2 and 24 months, with complications or recurrence**
- Approximately **25%** of patients may **survive beyond 2 years**, although they may **experience significant neurological deficits.**

EVALUATION

- A **non-contrast high-resolution CT scan** is **positive** in 95-98%

CT may **predict the aneurysm location** and can also assess:

- Hydrocephalus occurs in 21% of cases
- ICH
- Infarction
- **Amount of blood in the cisterns** - prognosticator of **vasospasm**

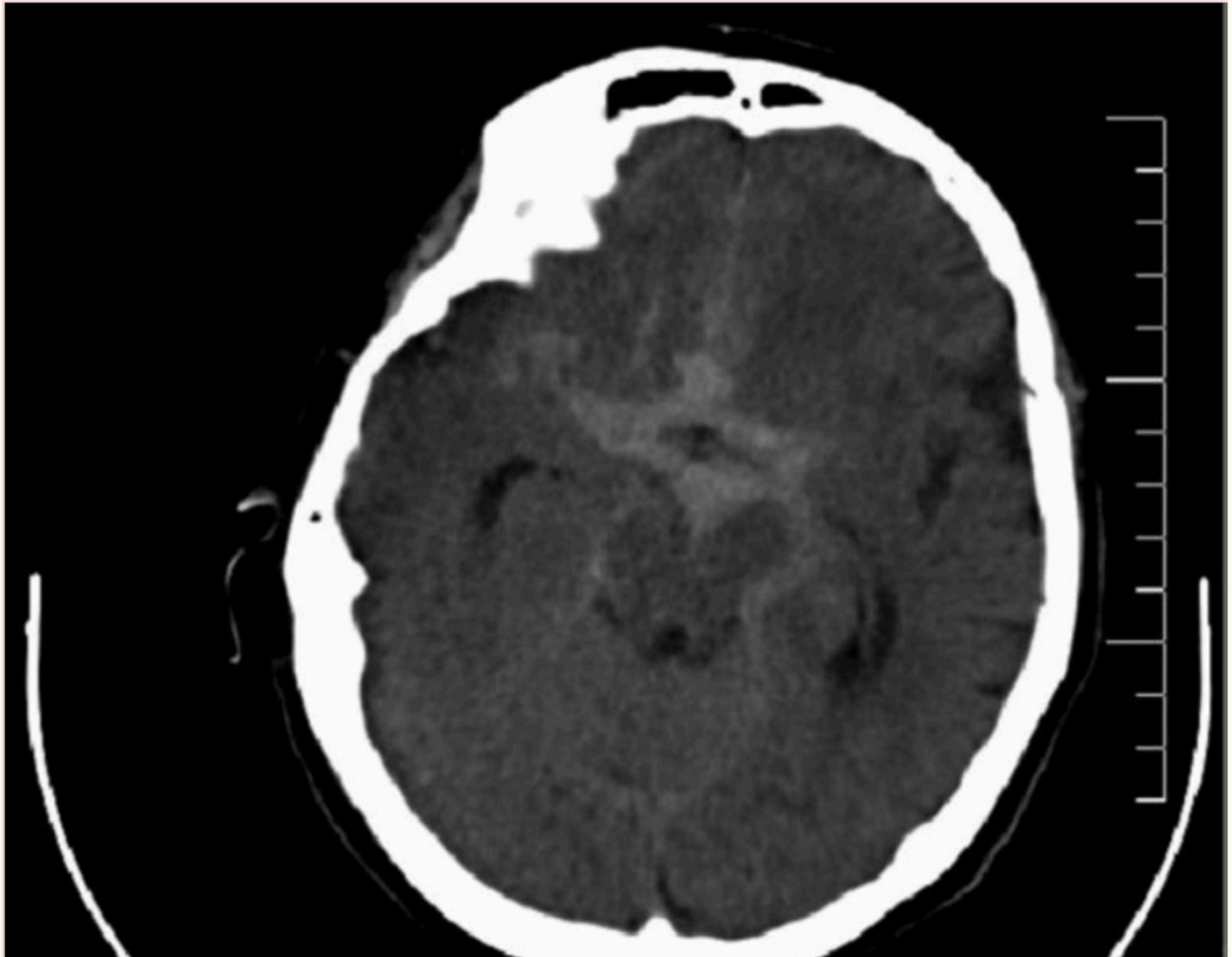
EVALUATION

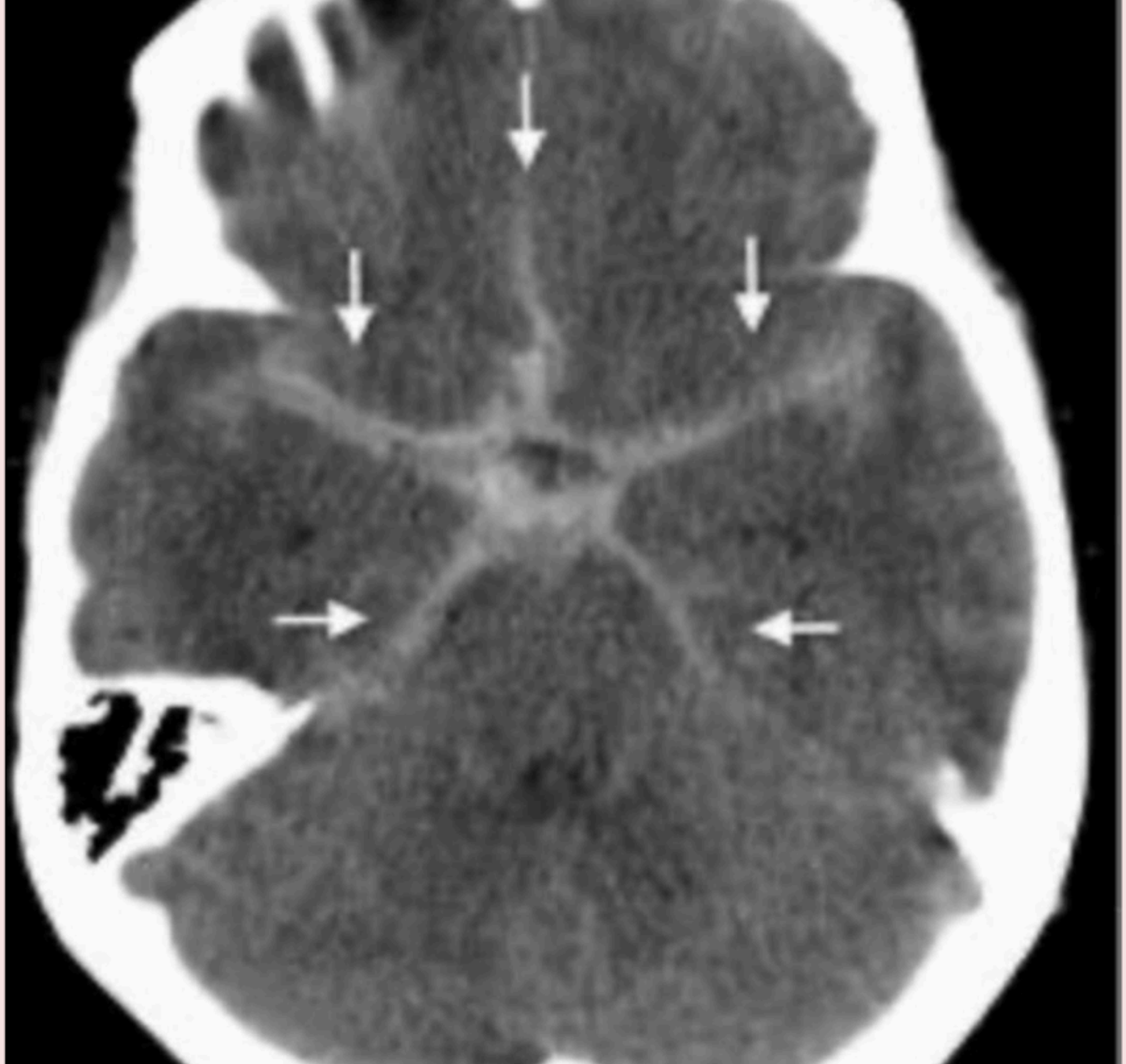
Lumber Puncture

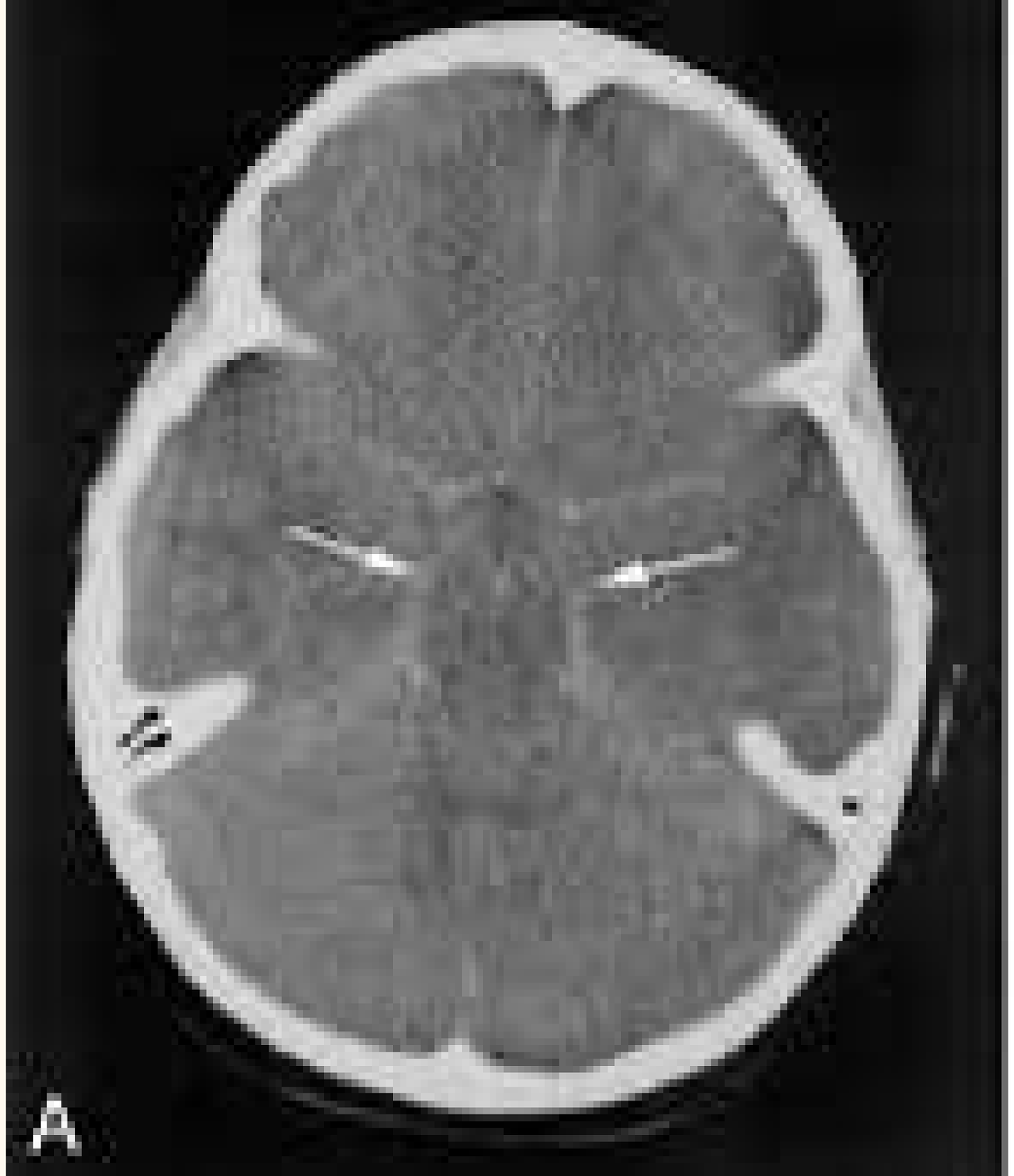
- used in Anemic patients
- may induce bleeding - not done routinely
- 3 tube test
- Xanthochromia is positive after 6 hours

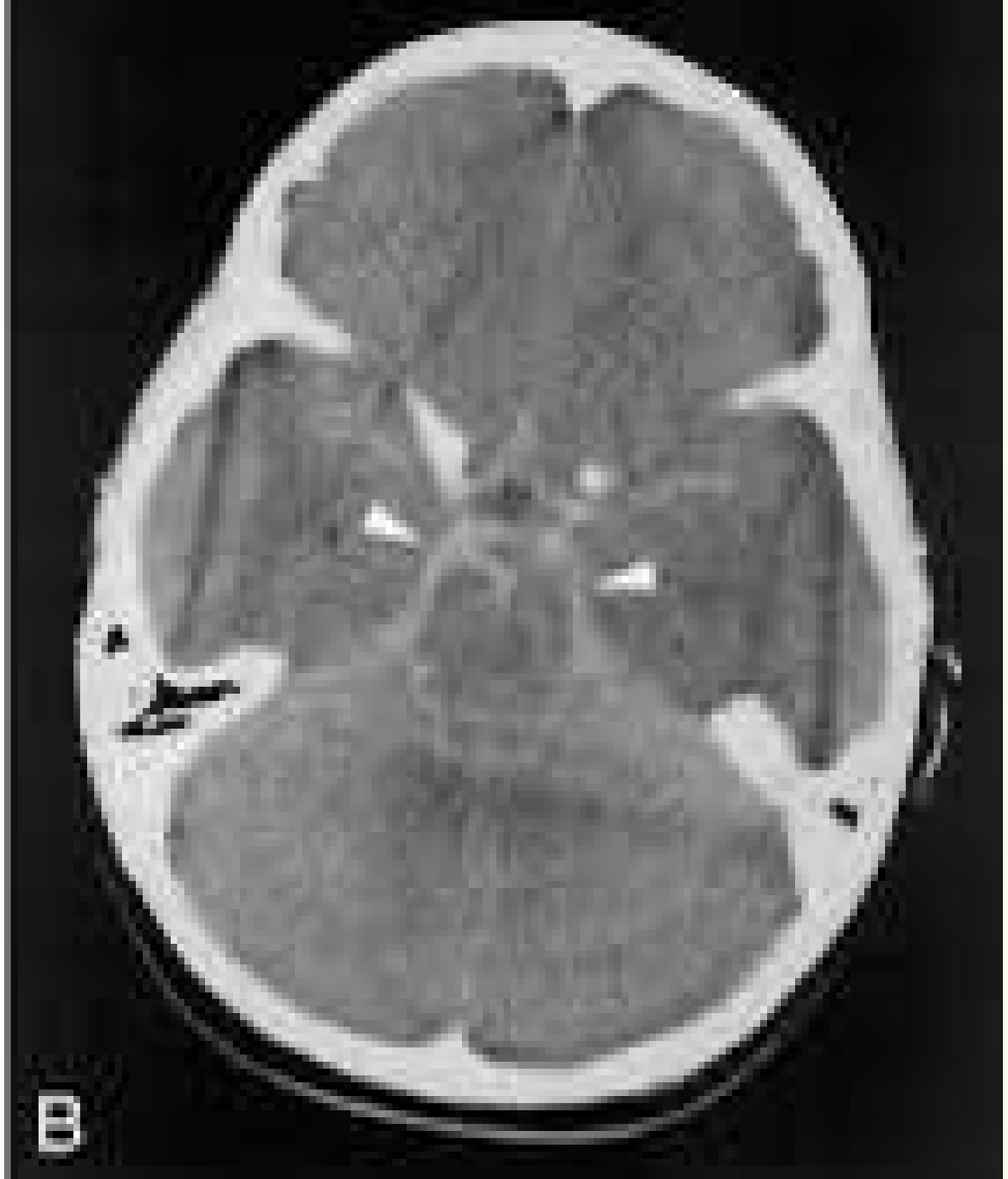
MRI

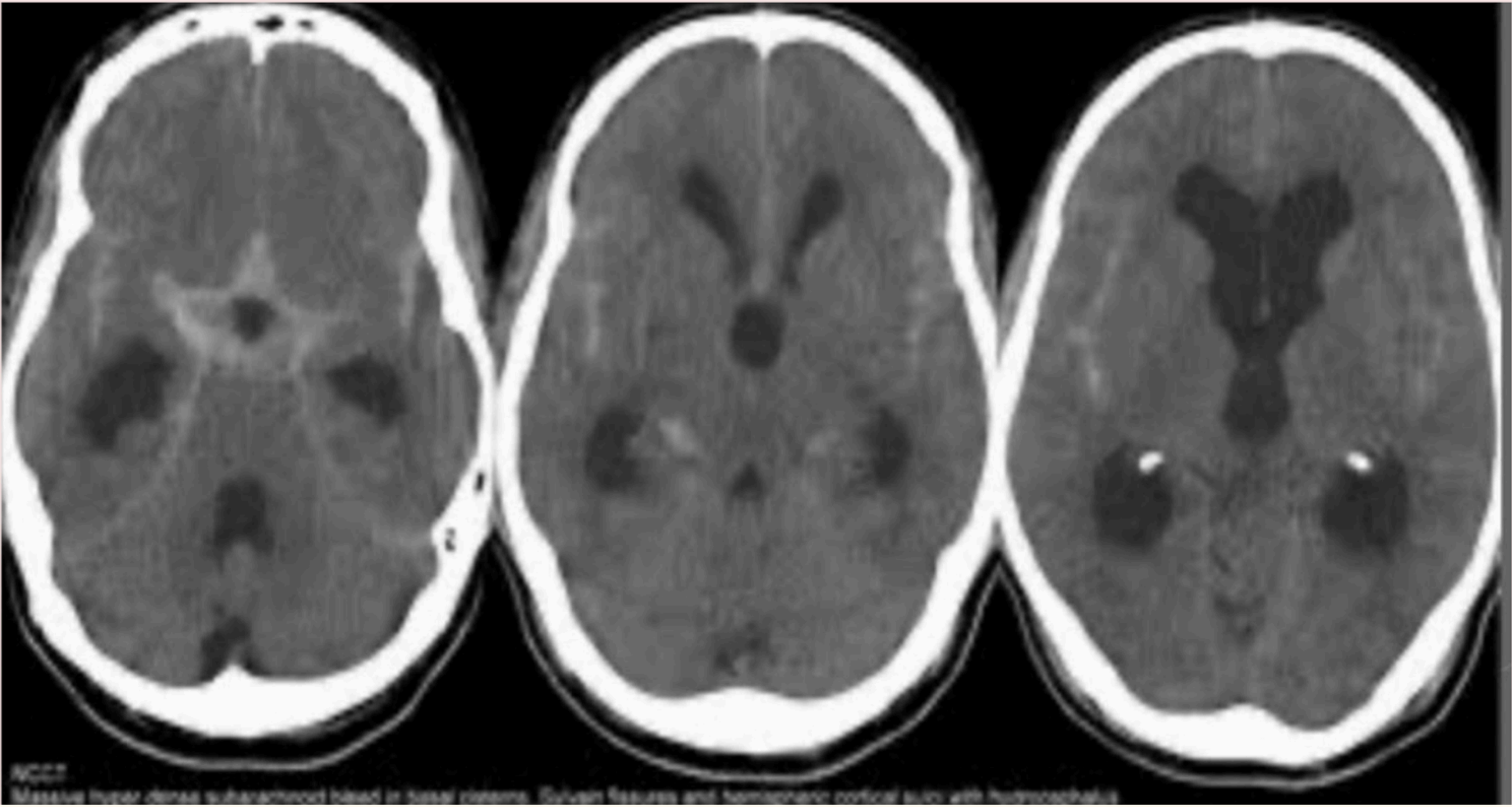
- not sensitive
- helpful after 4-10 days





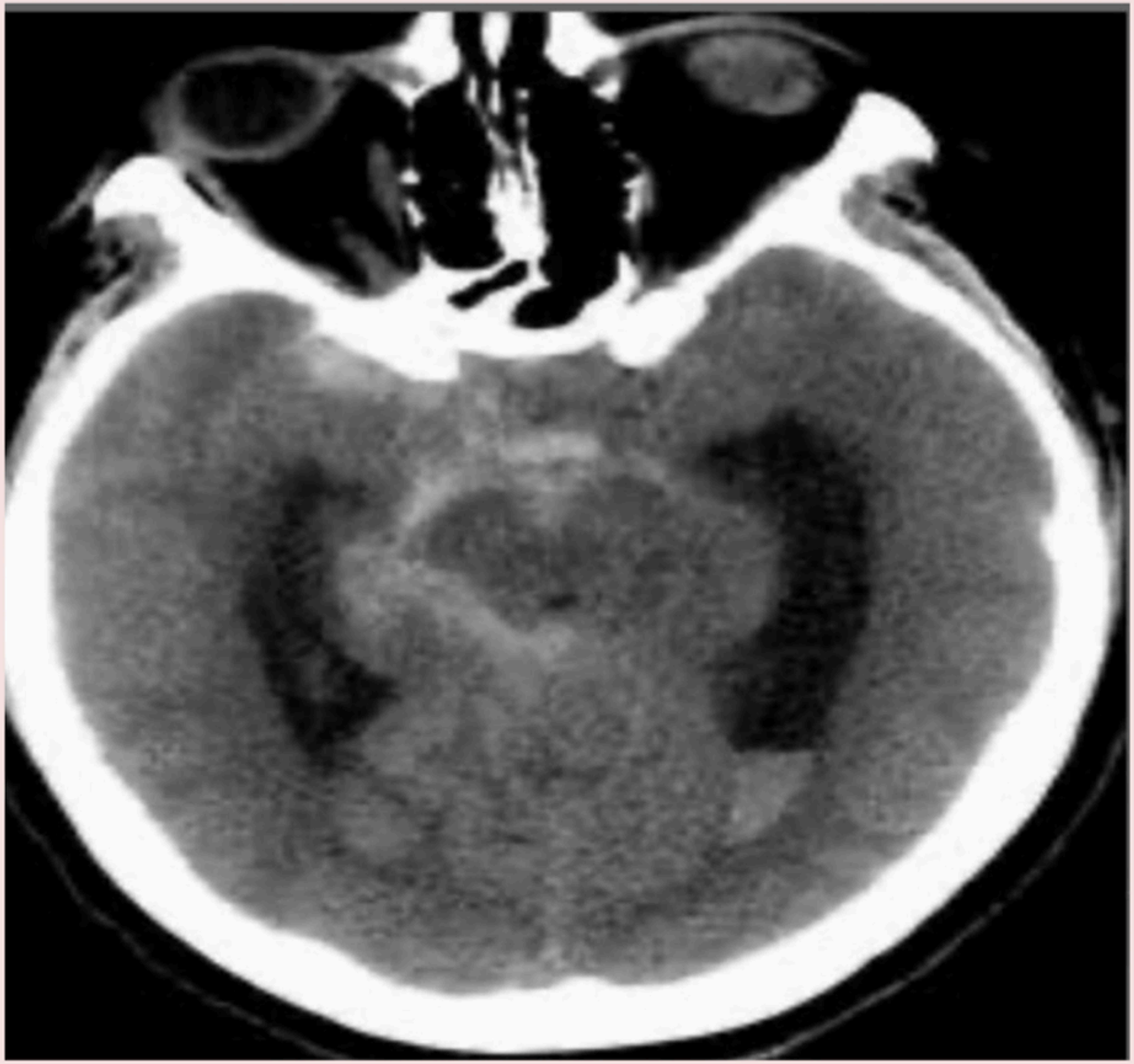

A

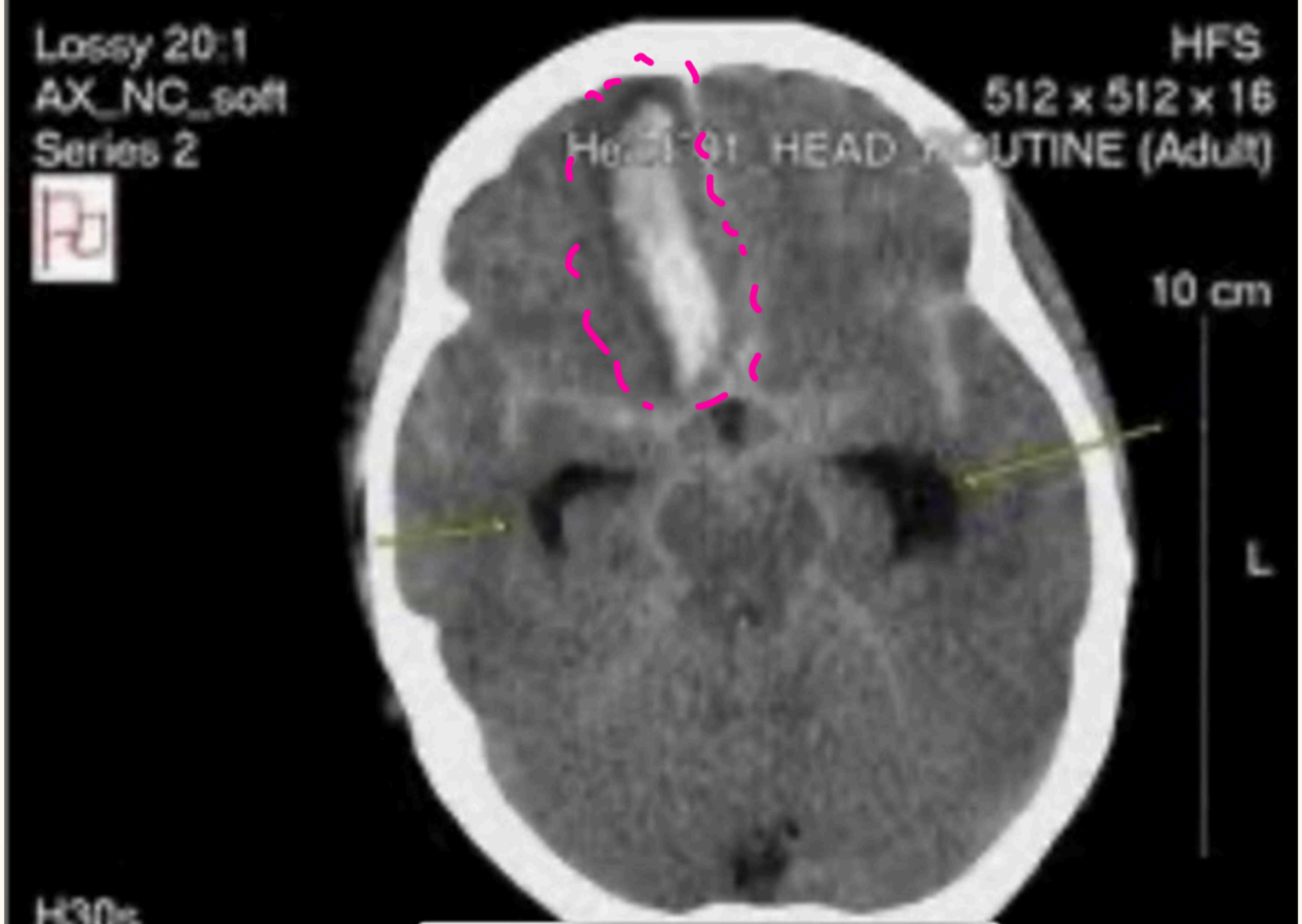

B

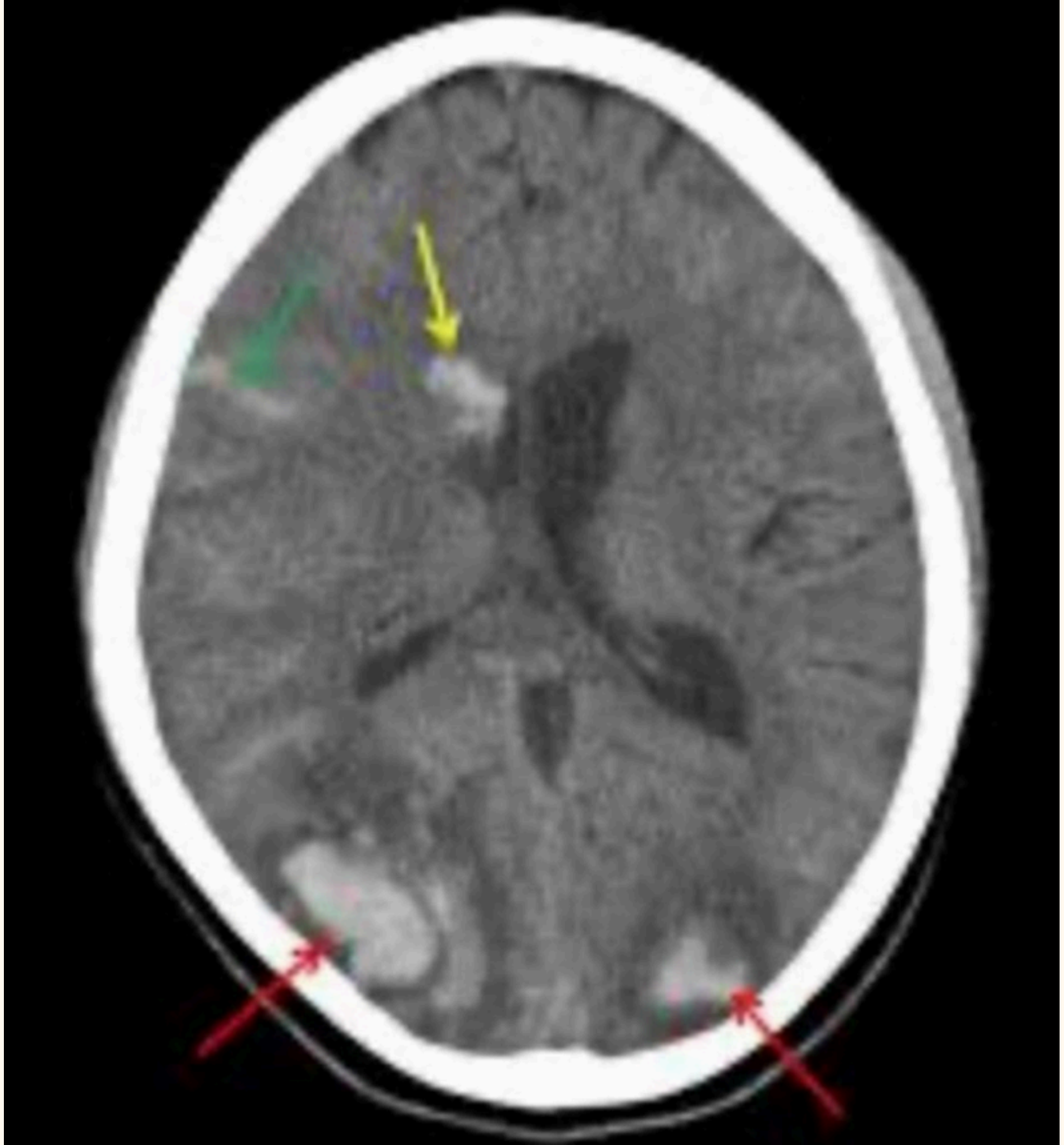


NCCT

Massive hyper dense subarachnoid blood in basal cisterns, Sylvian fissures and hemispheric cortical sulci with hydrocephalus

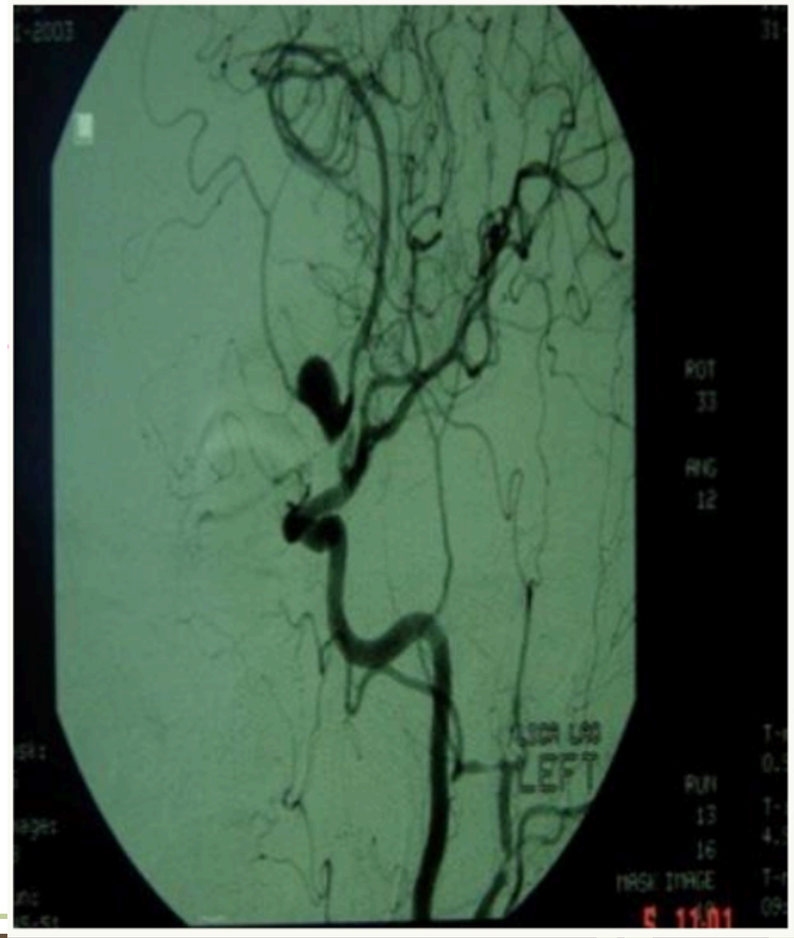


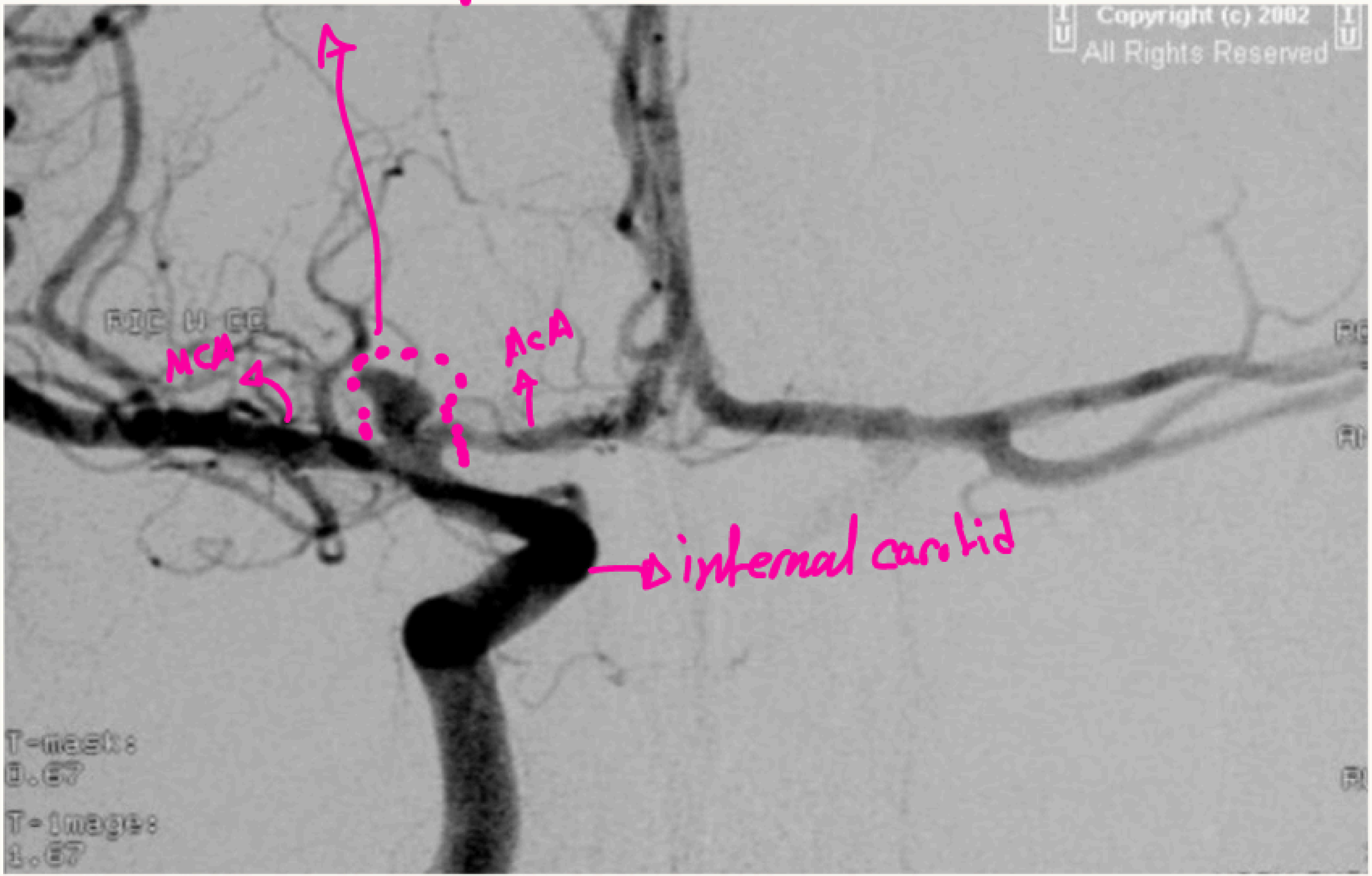

Lossy 20:1
AX_NC_soft
Series 2
HFS
512 x 512 x 16
HEAD ROUTINE (Adult)
10 cm
L

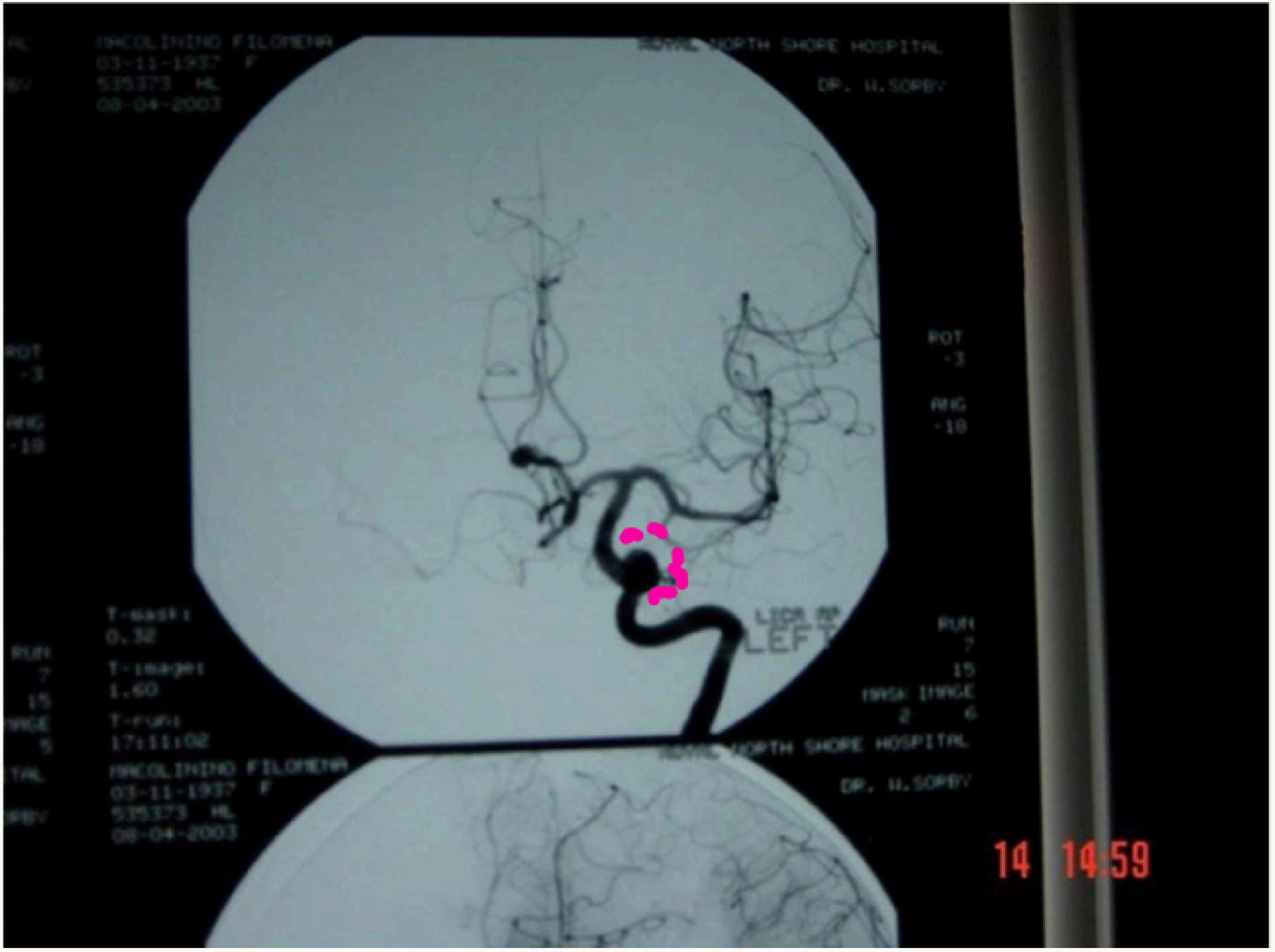


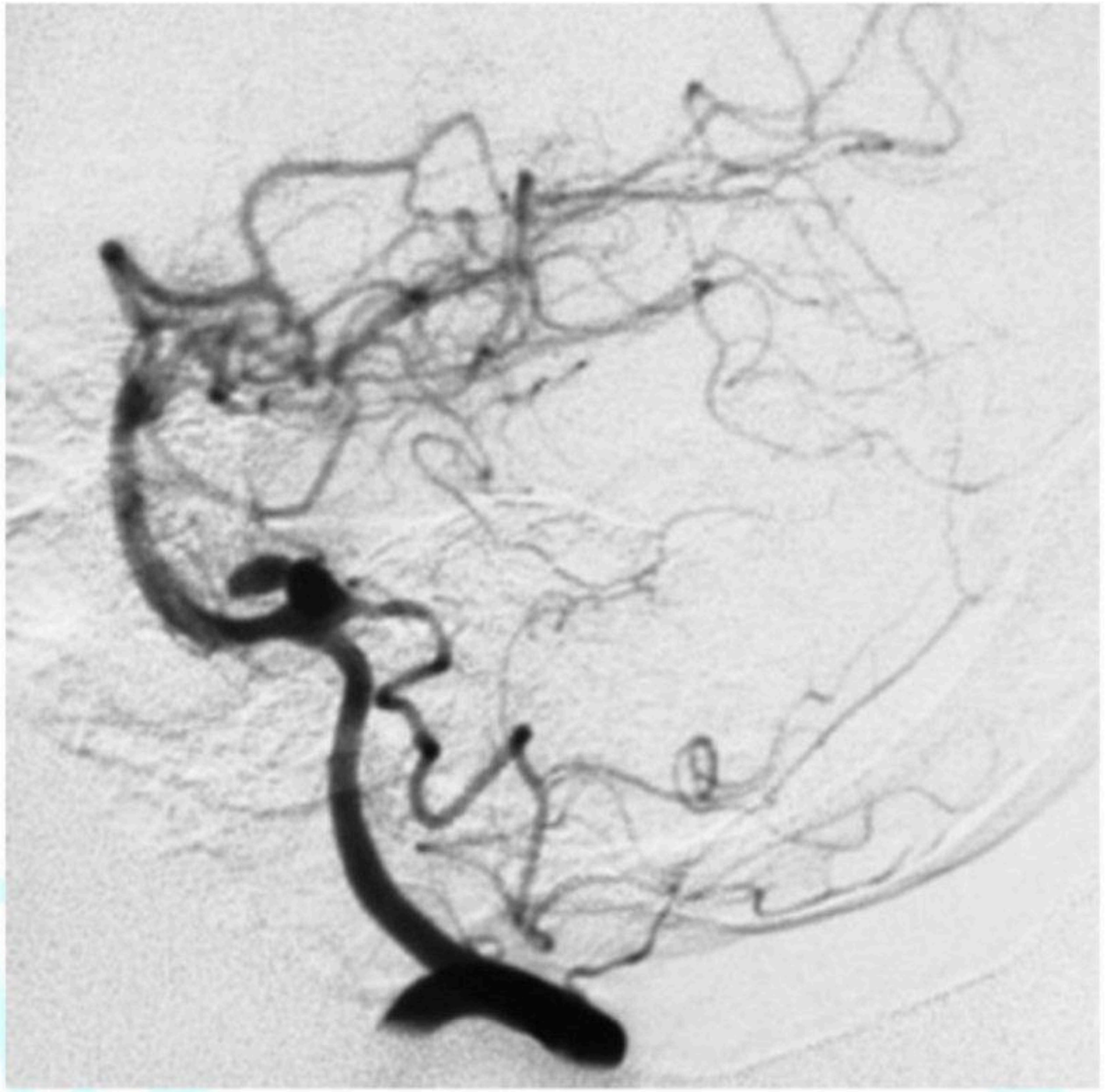
ANGIOGRAM DSA

- Demonstrate the cause of the SAH, usually an aneurysm, in 85-95%
- Study the 4 vessels [2 internal carotid and 2 vertebral arteries] to rule out additional aneurysms and collateral circulation
- 3 views for each vessel




Copyright (c) 2002
All Rights Reserved
MCA
ACA
internal carotid


MACOLIHINO FILOMENA
03-11-1937 F
535373 ML
08-04-2003
NORTH SHORE HOSPITAL
DR. W.SORBY
POT
-3
AVG
-18
T-mask:
0.36
T-image:
1.60
T-run:
17:11:02
RUN
7
15
IMAGE
5
LEFT
14 14:59



GRADING SAH

Hunt & Hess [it's subjective, not objective]

0: unruptured

1: asymptomatic, mild headache, slight nuchal rigidity

2: Cranial Nerve palsy, severe headache & nuchal rigidity

3: focal deficit, lethargy, or confusion

4: stupor, hemiparesis, decerebrate

5: deep coma moribund appearance

GRADING SAH

WFNS GRADING [it's objective]

WFNS grade	GCS Score	Major deficit
0	-	-
1	15	absent
2	13-14	absent
3	13-14	present
4	7-12	Present or absent
5	3-6	Present or absent

GRADING SAH

FISHER GRADING [for vasospasm complication]

- correlates between blood on CT and the risk of vasospasm

1	No blood detected
2	Diffuse < 1 mm thick
3	Localized clot or and > 1mm
4	ICH, IVH

COMPLICATIONS

-Rebleeding

- **Risk** of rebleeding is **highest on the first day**
- 15-20% may experience rebleeding **within the first two weeks.**
- 50% of **deaths occur within the first month**
- Early surgery prevents rebleeding
- should monitor BP

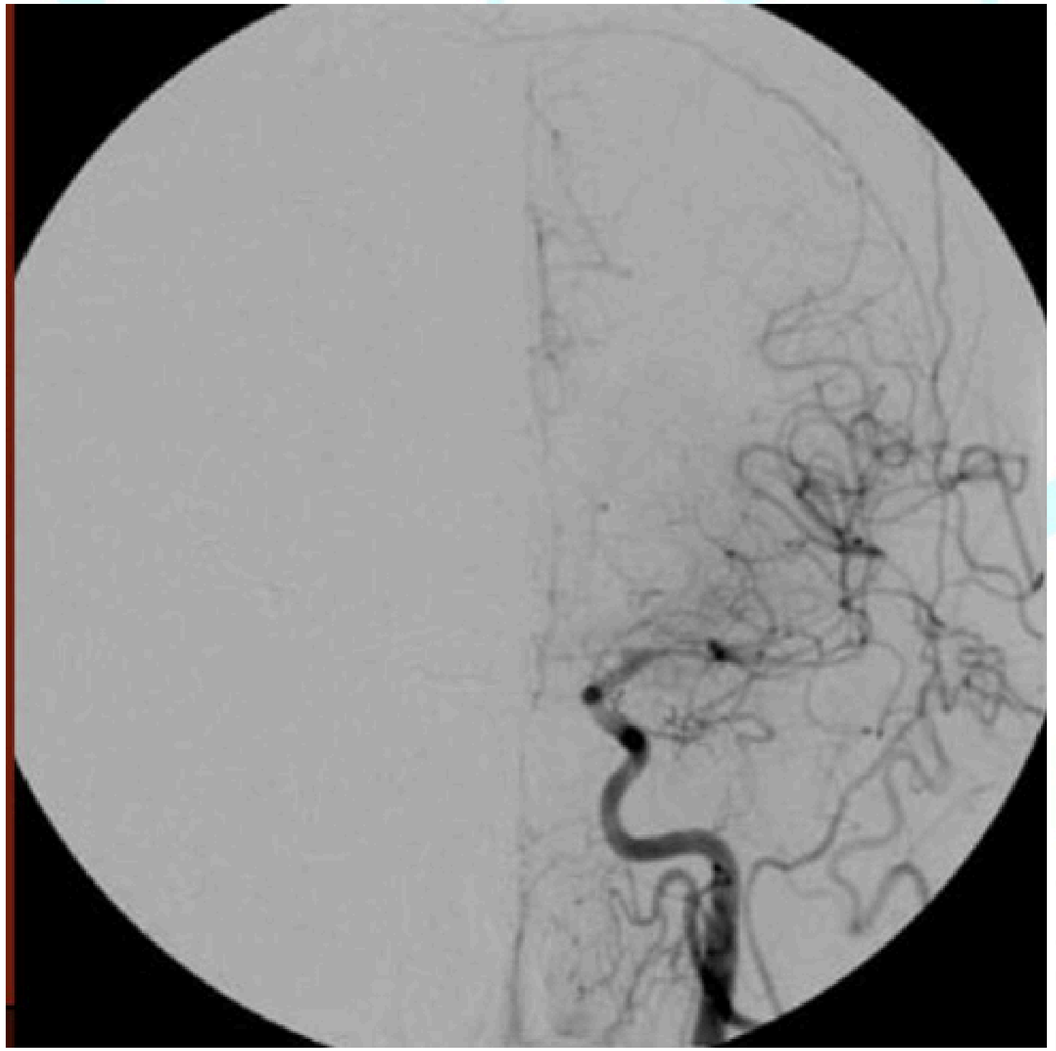
[high bp: increases risk of rebleeding]

[low bp: increases risk of ischemia]

COMPLICATIONS

- Vasospasm
  - **Significant complication** in aneurysmal SAH and can also occur after traumatic injury
  - Never occurs before day 3 post-SAH, it **peaks around days 5 to 7 after the hemorrhage**.
  - Symptoms **develop gradually** [Increased headache and lethargy, New focal neurological deficits, Hyponatremia]
  - **more common in ACA** >> MCA

- Radiological Vasospasm: **arterial narrowing** is demonstrated on the angiogram, accompanied by a **slow contrast filling**.



MANAGEMENT FOR VASOSPASM

- non-contrast CT scan
- electrolytes and ABGs
- Angiogram
- Transcranial Doppler
- CCB, Nimodipine vs Nicardipine for 21 days
- 3H protocol
- Dexamethasone
- Balloon angioplasty
- Intra-arterial papaverine
- ICP monitor

INITIAL MANAGEMENT

- ABCs and Vital Monitoring (check every hour)
- Neurological Assessment

(GCS <8-intubate and admit to the ICU)

- Head up 30degrees
- Imaging: CT scan and CT angiography
- Arterial & Venous catheters
- Fluid management to avoid hypotension
- Maintain SBP < 160mmHg

BLOOD PRESSURE VOLUME MANAGEMENT

Unsecured Aneurysm

- gentle volume expansion and hemodilution prevent vasospasm
- HTN maintained <160 mmHg - CCB (nimodipine), nicardipine, labetalol
- continuous neurological assessment

BLOOD PRESSURE VOLUME MANAGEMENT

Clipped Aneurysm

- Maintain stable blood pressure while allowing adequate cerebral perfusion
- Maintain SBP within a safe range; careful use of antihypertensives
- Administer IV fluids to maintain euvolemia; monitor the intake to prevent fluid overload
- Administer nimodipine to reduce the risk of vasospasm

SURGICAL TREATMENT

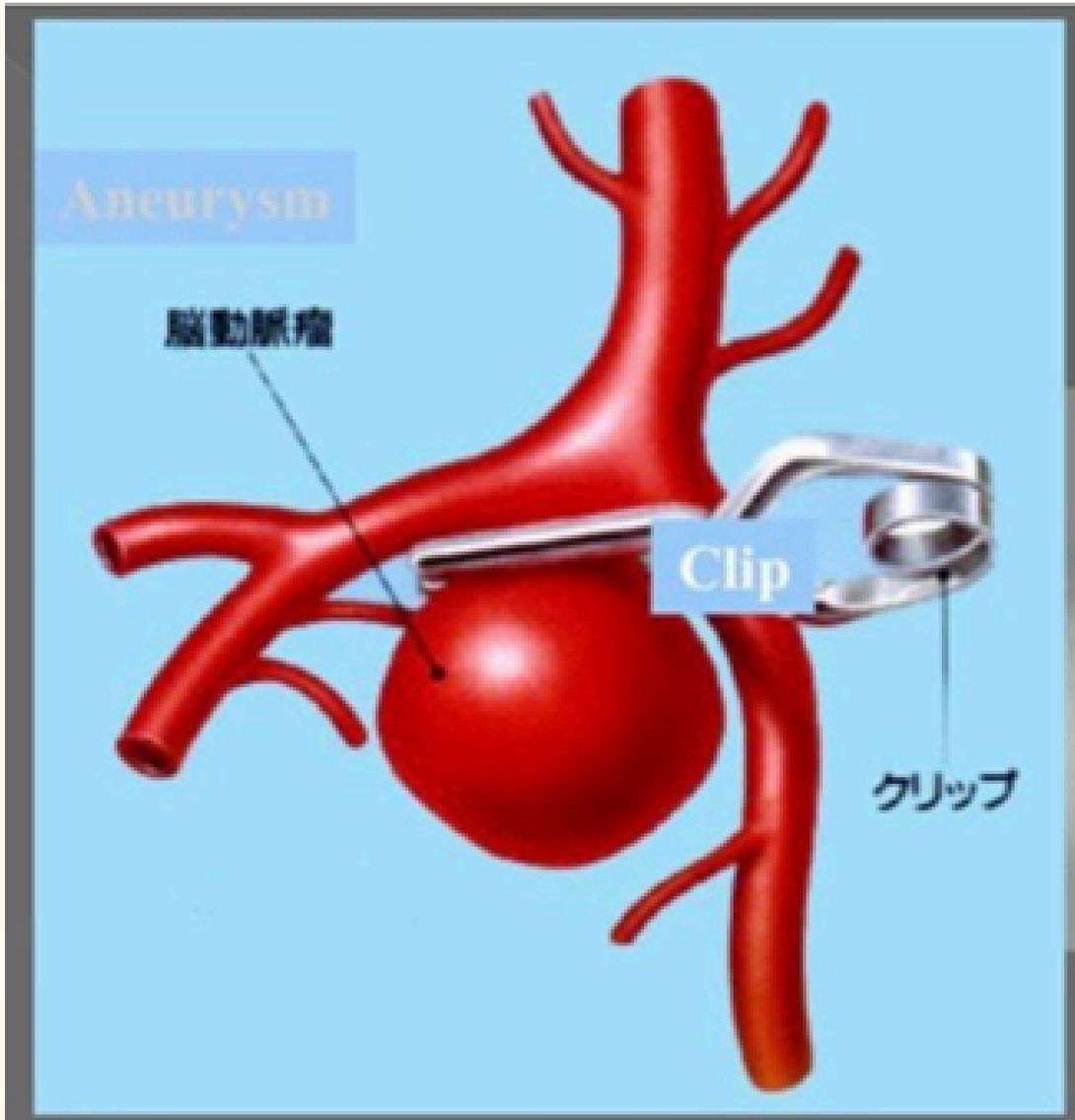
- Surgical treatment of cerebral aneurysms is essential in preventing rebleeding and managing complications.
- Goal of the surgery is to prevent rupture or further enlargement while preserving normal vessels and minimizing brain injury

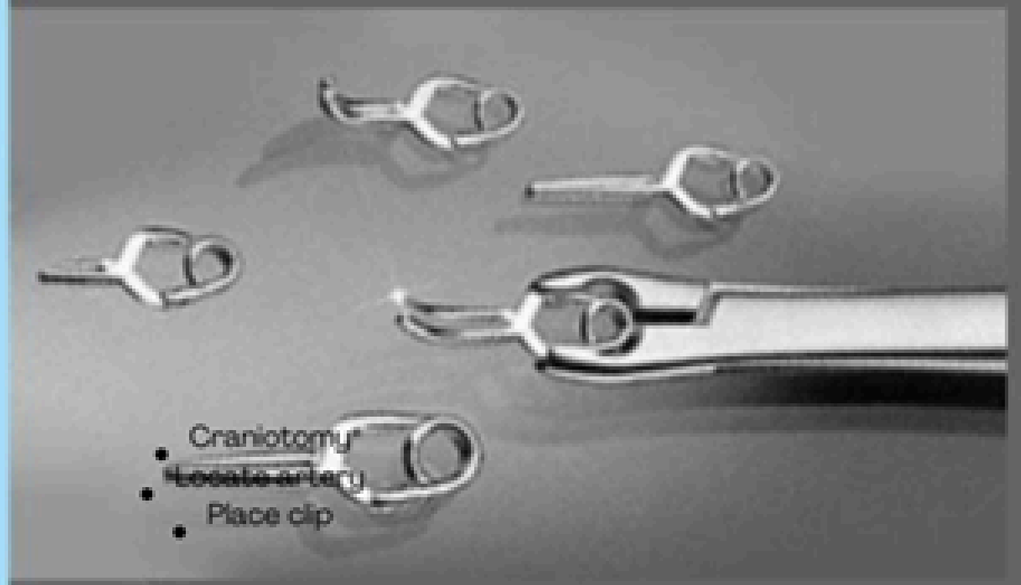
Two primary surgical techniques:

- Clipping - GOLD STANDARD
- Coiling

CLIPPING

- primarily indicated for ruptured or unruptured aneurysms
- A metallic clip is placed across the neck of the aneurysm to occlude it
- Neurological defects depend on the aneurysm's location, infection, cerebral edema, and vasospasm





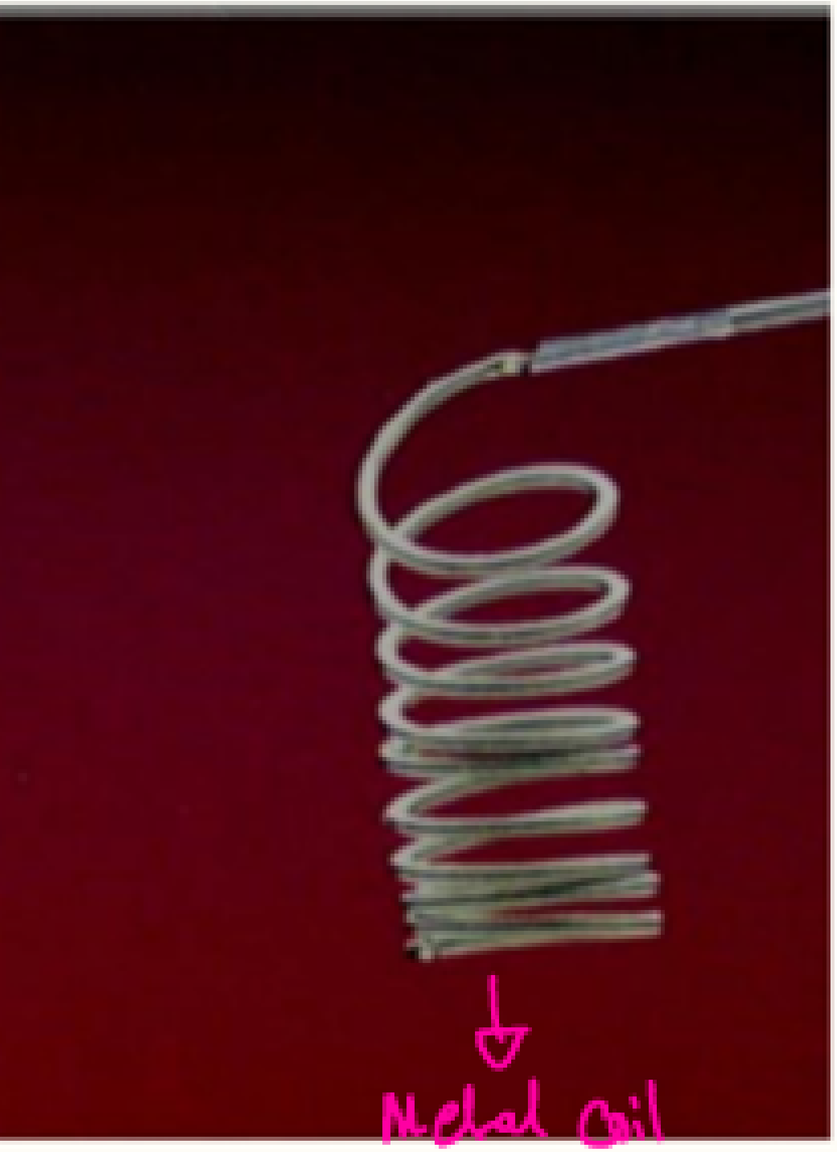
- Craniotomy
- Locate artery
- Place clip

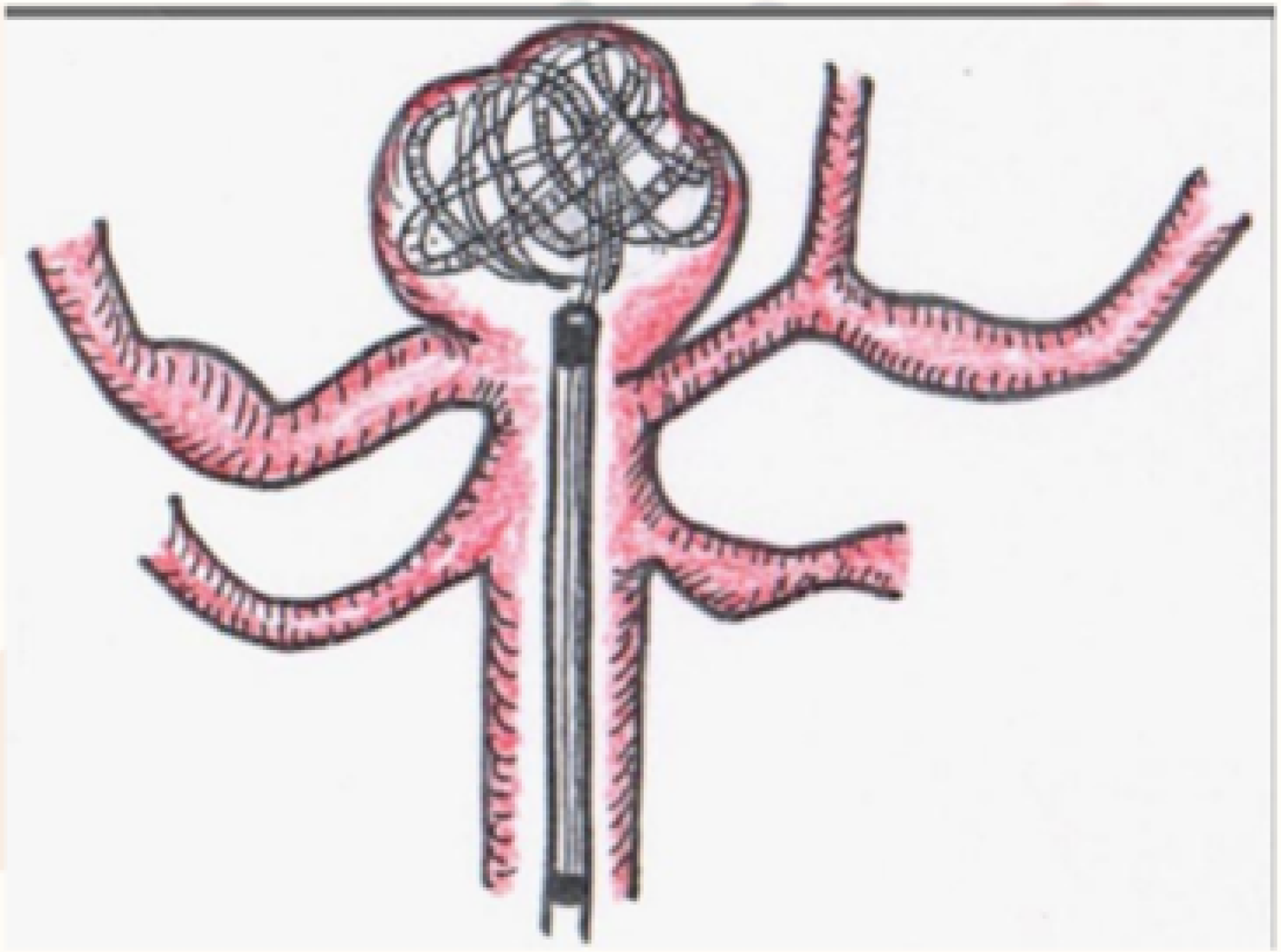
FACTORS FAVOUR CLIPPING

- younger age group (low risk for surgery and lower lifetime risk for recurrence).
- MCA bifurcation aneurysm.
- giant aneurysm (>20mm).
- symptoms due to mass effect.
- small aneurysms (<1.5-2 mm).
- wide neck aneurysms.

ENDOVASCULAR COILING

- commonly used for a **ruptured aneurysm**
- catheter is inserted through the femoral artery then **soft platinum coils** are deployed into the aneurysm
- to **promote clotting and occlusion**
- less invasive, shorter recovery time, better for posterior circulation aneurysm
- potential for coil migration or recurrence of the aneurysm, risk of thromboembolic complications


Metal coil



FACTORS FAVOUR COILING

- Elderly patients.
- Poor clinical grade.
- Posterior circulation aneurysms.
- Aneurysm morphology:

- dome-to-neck >= 2mm
- neck diameter < 5mm

TIMING OF SURGERY

The two primary approaches are **early surgery** (within the first 3 days) and **late surgery** (after 10 days).

Each approach has its advocates based on specific rationales.

TIMING OF SURGERY

Early Surgery

- Reduce the Risk of Rebleeding
- Facilitate Treatment of Vasospasm
- Removal of Potentially Vasospasmogenic Agents

Late Surgery

- Stabilization of the Patient
- Reduced Surgical Risks
- Potential for Spontaneous Thrombosis

GIANT ANEURYSM

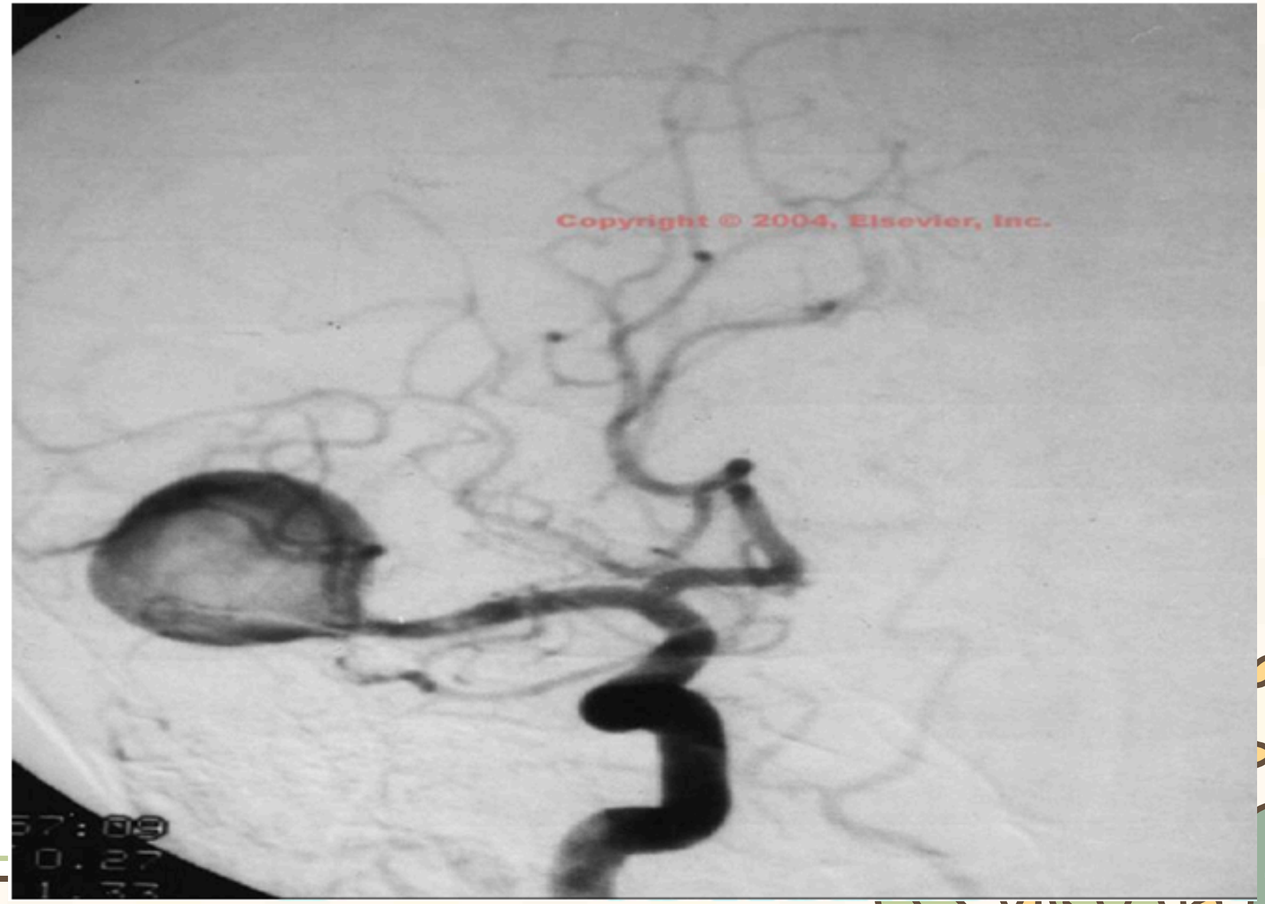
➢ Less than 1 cm is small ➢ 1-2.5 is large

➢ More than 2.5 is giant

- Saccular and fusiform
- 3-5% of all aneurysms
- Peak 30-60 F: M 3:1
- 35% present with bleeding
- The rest present with TIAs or seizures or mass effect.

GIANT ANEURYSM

- Angiogram often underestimates the actual size because of the thrombus
- CT and MRI with and without contrast are more informative




THANK YOU