

Subarachnoid Hemorrhage

↳ blood within the subarachnoid space.



غالباً

presentation

seizure : القها

Subarachnoid haemorrhage

T: anti-seizure medication

For 7 days. (if the seizure continue, continue the drug for 2 years).

- Blood within the CSF (Subarachnoid space)
- Trauma: most common. (trivial)
- ✓ Spontaneous, Causes: (at the base of the skull) major vessel (Cortical) قنوة كبرى
- Ruptured berry aneurysms; 75-80%
- AVM. (abnormal connection between an artery + vein).
- Vasculitis.
- Tumours.
- carotid dissection. (tear) (layers?). *most common spontaneous
- HTN. ↳ tunica media interna
- Unknown; 10-15% adventitia?

ruptured berry aneurism

Some facts **role of 7.*

70

- Annual rate: 10-28/100,000
- 10-15% die before reaching the hospital.
- Among survival, rebleeding is the major cause of M&M risk. *(mortality and morbidity)*
- 7% will die from vasospasm.
- Another 7% will have severe deficit due to vasospasm. *(stroke).*
- Overall one third will have good results.
- 85-95% of aneurysms occur in ICA *(internal carotid artery)*
- 5-15% in posterior circulation *↓
↓
↓ anterior circulation. [circle of willis]*
- 20% of aneurysm patients have multiple aneurysms

*bad prognosis.

→ balloon dilatation of an arterial vessel wall.

Berry aneurysms

- Aneurysm rupture 6-12/ 100 000/ y
- Peak age is 55-65 (↑ with age)
- * females more than males 3:2
- 30% of aneurysmal SAH occurs during sleep
- → 30-50% of patients have warning symptoms 1-3 weeks before SAH (sentinel leakage) → minor leakage of blood, irritation
- SAH complicated with ICH 20-40%, IVH in OF meninges, 15-35%
- → The 30 day Mortality rate is 50-60% with treatment [without T → die]
- Those who survive initial bleed 6 month mortality rate is 60%



* F > M

Aetiology

- Congenital predisposition due to defect in the arterial wall [Fluctuation]
- Atherosclerosis *diurnal variation of blood pressure
- → HTN presumed to be the most implicated factor for initiation, growth and subsequent rupture due to variable hemodynamic changes.
- Infectious or mycotic aneurysm (misnomer: Fungal but occur in bacterial) → Cortical aneurysms
- Traumatic as in dissecting aneurysms → Fusiform aneurysms (امتروحية)
- Genetics as seen in familial aneurysms is well established such as in PCK, Marfan's, EDS.



Pediatric types).
ass with coarctation of aorta
+berry aneurysm.

→ Risk factors

- HTN
- Diurnal variation in blood pressure
- Smoking
- Alcohol consumption
- Coffee consumption
- Oral contraceptives
- Drug abuse

(night → nervous -
tensive
day → HTN).

Clinical features

- **Ruptured 95-97%**
- Sudden onset of **severe headache** . → Headache رأس مقلع
بحر عليه .
- Associated with **vomiting** and/or **LOC**.
- **Focal cranial nerve deficits**.
- **Back pain** . → (sign of meningitis) (meningitis)
neck stiffness
- ✓ **Nuchal rigidity, Kernig's, Brudzinski's sign**
- ✓ **Sentinel haemorrhage** causes **warning headache** .
↳ (guardian headache).
↳ bleeding within the wall of aneurism

Natural history of ruptured aneurysm if treated conservatively studies in 60's

* very bad prognosis.

Of 100 patients 15% die before reaching hospital

- 15% die in first 24 h in hospital
- 15% die between 1-14 days
- 15% die between 2-8 weeks
- 15% die between 2-24 months
- 25% may survive > 2 years

* no role for conservative treatment.

SAAH → arterial but there's venous
and can be treated by conservative

[traumatic]

↳ ↑ risk of seizures

Evaluation

- * Non contrast high resolution CT scan is positive in 95-98%
- CT can also assess the following
 - ✓ Hydrocephalus which occurs in 21%
 - ✓ ICH
 - ✓ Infarction
 - ✓ Amount of blood in cisterns which is a prognosticator in vasospasm
 - ✓ Ct may predict the aneurysm location
 - ↳ give a clue in the site of the aneurysm

- ⊗ **LP** lumbar puncture :-
- in questionable cases
- Pressure is elevated
- ✓ 3 tube test (venous).
- **Xanthochromia** after **6 hours**
- **MRI** → 4-10 days
- is not sensitive acutely
- May be helpful after **4-10 days**

* most sensitive for SAH → **Flaire**.

فلاير

* 3 tube test :-

عشان اميز هل هي traumatic
or subarachnoid ?

اذا كانت SAH نبدأ ب blood

هو موجود الكيف في او traumatic نبدأ او

نخلفي اللون في او tube #3

in acute cases

* Xanthochromia; yellow
(بسبب bilirubin)

by centrifuge

* Spontaneous SAH.

patient profile 1" x 1" x 1" *

* CT Scan
without contrast
brain window
axial view

⊕ Showing SAH
[blood in the
basal cistern].

⊕ Hyperdensity in the
base of the skull
around circle of willis.

circle of
willis.

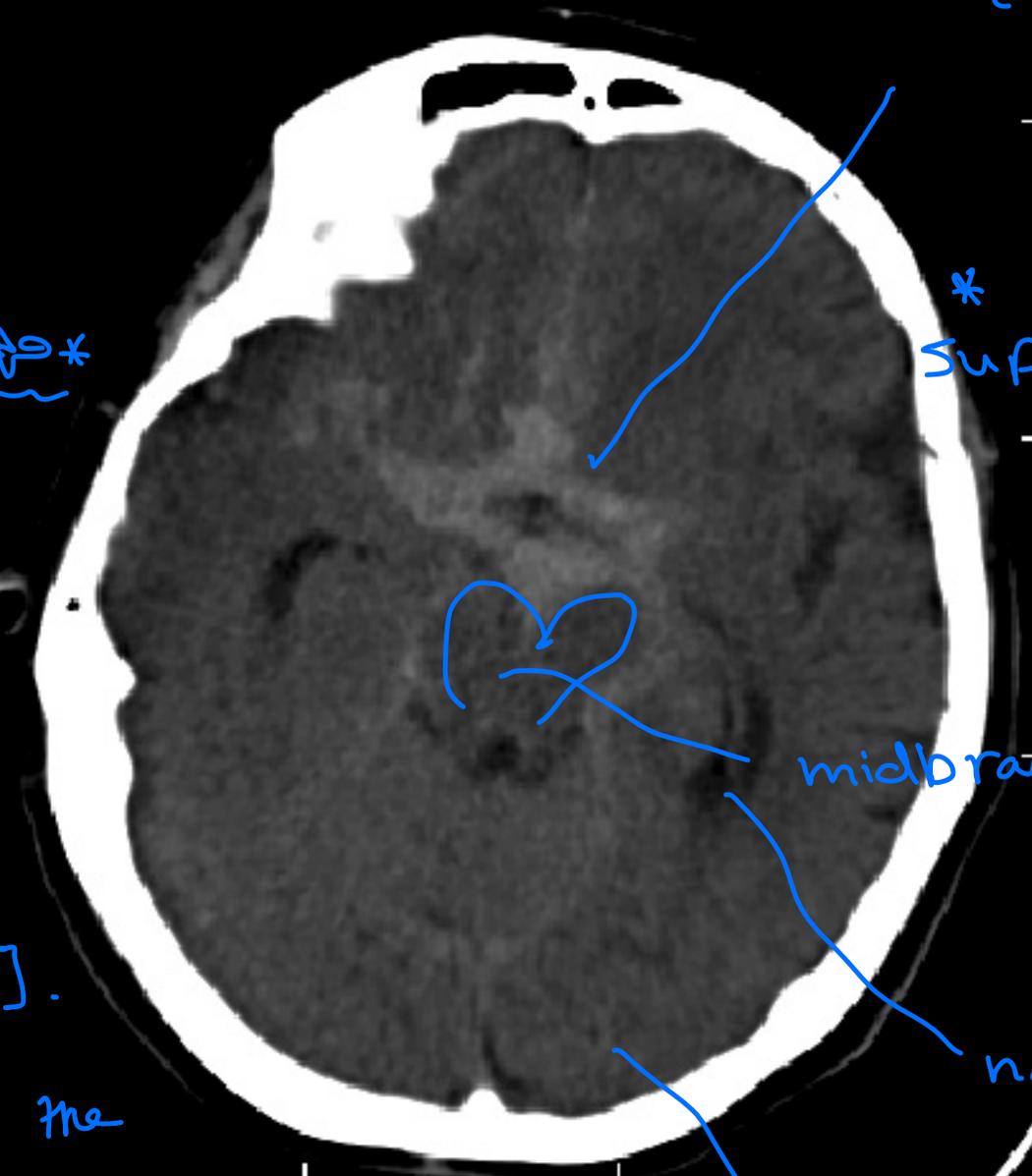
* Suprasellar
cistern.

midbrain

no

hydrocephalus

brain edema



blood flow direction

angioma

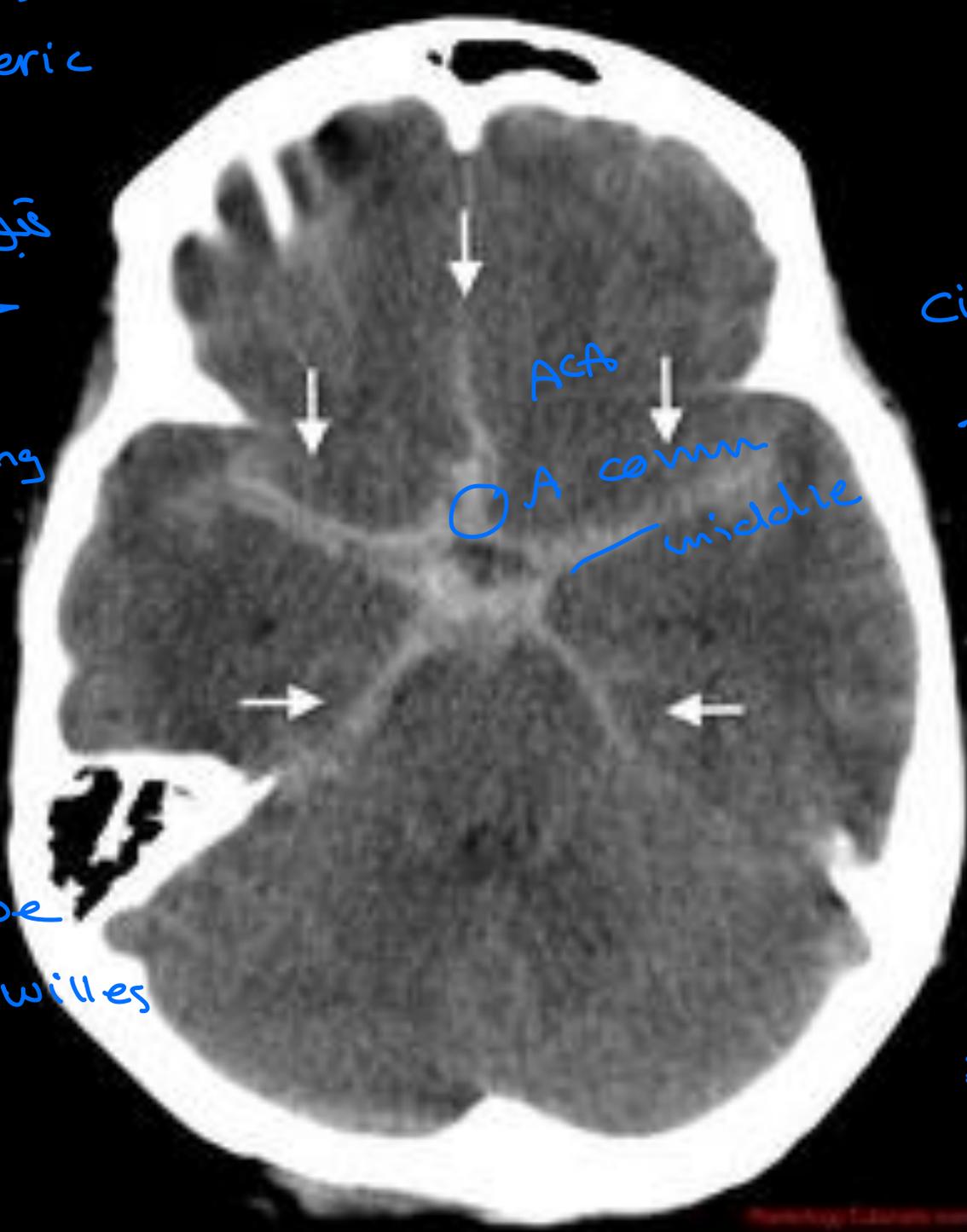
not significant

interhemispheric
fissures

aneurysm

ACA

Anterior communicating
artery.



circle of
willes.



ACA
Circle of Willis
ACA comm
middle

*non contrast
CT

*axial view

*brain
window

*star shape

*circle of willies

*SAM



* IP GCS 5: (angry brain)

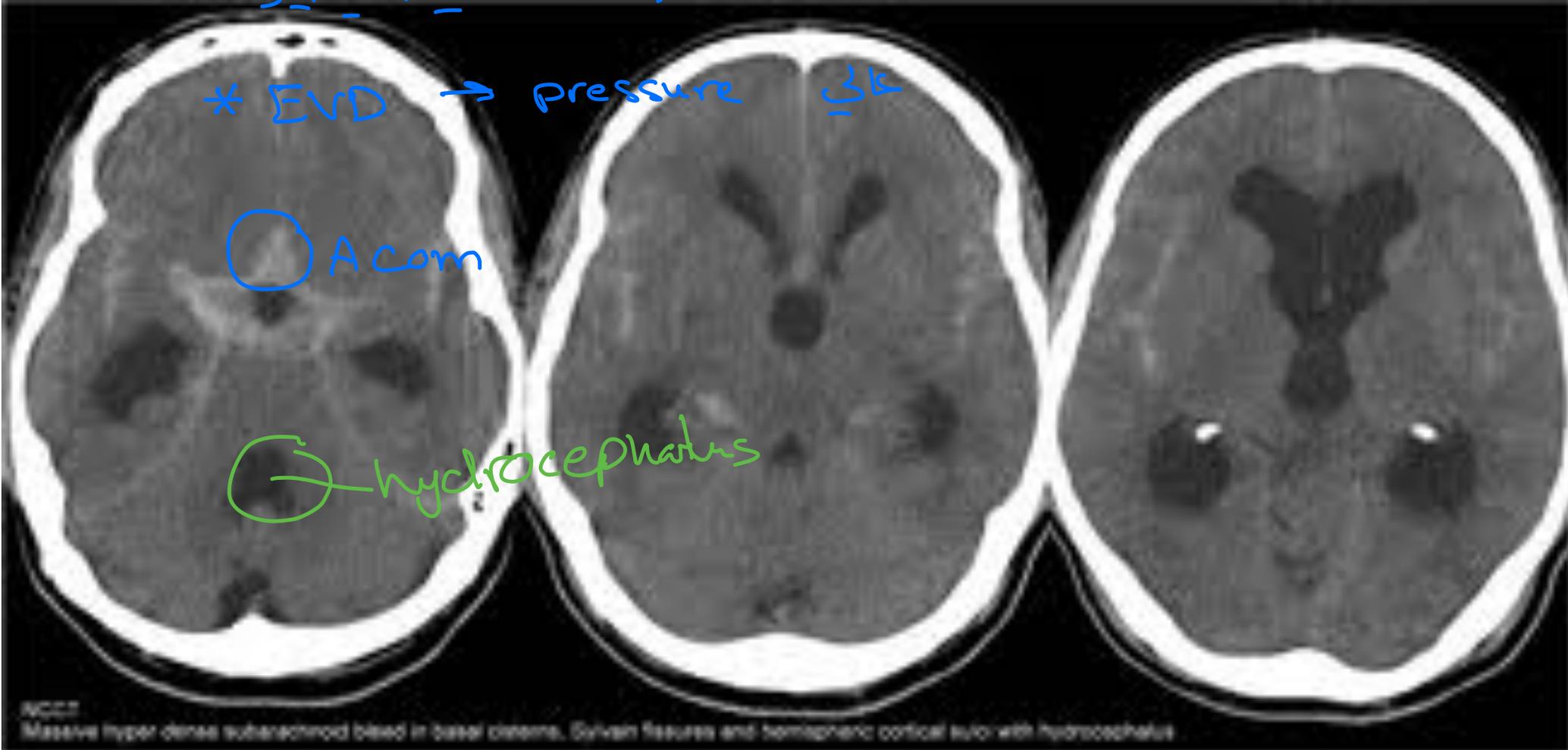
normal ICP → 15-20

dexamethasone * بالستيرويد

or mannitol.

(nemo depim) → neuroprotective (↓ vasospasm)

vasospasm بالوهج الشرياني أو الالتهاب الشرياني



*ass with hydrocephalus. [communicating]



Fluid-Fluid
level

intra
ventricular
Hemorrhage

Lossy 20:1
AX_NC_soft
Series 2



gyrus
rectus

A. com
aneurism.

HFS
512 x 512 x 16
Head01_HEAD_ROUTINE (Adult)



10 cm

Intra -
cerebral
hemorrhage

+ hydroceph

H30s
kV 120

L



X-ray

bone كَيْسِل اد

و ايسون بيس
blood vessels

Angiogram DSA (diagnostic)

لإزالة

- Demonstrate the cause of the SAH usually aneurysm in 85-95%
- Study the 4 vessels to rule out additional aneurysms and collateral circulation
- 3 views for each vessel

Digital subtraction angio.
UP bone.

* كَيْسِل اد سبب " aneurysm و كادها .



* most common site of berry aneurysm?
at branching points of MCA, ICA



* berry aneurysm

4 vessel angio

* 2 internal carotid + 2 vertebral artery

2 external carotid + " + " (6-vessels angio).

PAL MACOLININO FILOMENA
03-11-1937 F
BY 535373 HL
08-04-2003

ROYAL NORTH SHORE HOSPITAL

DR. H. SORBY

*Anterior
Comm
aneurysm*



ROT -3
ANG -18

ROT -3
ANG -18

T-mask: 0.32
T-image: 1.60
T-punt: 17:11:02

PUN 7
15
MASK IMAGE 2 6

PAL MACOLININO FILOMENA
03-11-1937 F
BY 535373 HL
08-04-2003

ROYAL NORTH SHORE HOSPITAL

DR. H. SORBY

14 14:59



Grading SAH

①

* Subjective not objective.

Hunt & Hess

- 0: unruptured (incidental).
- 1: asymptomatic, mild headache, slight nuchal rigidity [sentinel symptoms]
- 2: Cranial Nerve palsy, severe headache & nuchal rigidity [→ not focal deficit].
- 3: focal deficit, lethargy or confusion
- 4: stupor, hemiparesis, decerebrate
- 5: deep coma moribund appearance

②

more objective.

prognosis.

درجہ الامتحان .

WFNS GRADING

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

③

Fisher grading system

← (not prognostic)

For incidence of vasospasm



complication of SAH

correlates between blood on CT and the risk of vasospasm (never become before day 3)

risk of vasospasm ←

1	No blood detected
2	Diffuse < 1 mm thick
3	Localized clot or and > 1mm (thickness)
4	ICH, IVH any thickness.

Initial management

- Once SAH is documented admit to ICU
- Arterial & Venous catheters.
- Intubation if necessary
- EVD ? external ventricular drainage
(↑ risk of rebleed)
- Vital Signs with Neuro signs checks q 1 hr
- Head up 30. venous drainage + ↓ ICP.
- I'S & O's → sensible
→ non-sensible (breathing, sweating).
- IVF: 100-125 cc/h N/S vs. D/W + 20 meq kcl

↑ humidity in winter

continued

- **Medications**
- **Codeine phosphate** 30-60 mg q3h
- **Stool softeners, H2 blockers** (to prevent ICP elevation)
- **Ca channel blockers (Nimodipine):** 60mg q 4h PO. (neuroprotective) ↓ risk of vasospasm.
- **Dexamethasone may help with headache and neck pain.** (analgesic) ↓ inflammation.
- **Prophylactic anticonvulsant usually phenytoin is controversial** (effective) but have side effects.

Blood pressure volume management

- ✓ **Unsecured aneurysm:** (بدننا خافضه على ال (blood pressure)
gentle volume expansion & hemodilution may help prevent vasospasm
- HTN must be avoided keep at 120-150

↑ ICP لانه عنده او

كو نزلات فتنه بغير عنده
stroke // كوزدته بغير
rebleeding.

- ✓ **Clipped aneurysm**
- Aggressive 3 H treatment is recommended
- Keep SBP at 140-160 may be as high as 180
- Hyponatremia is common

- Over hydration or SIADH vs CSWS → dehydrated

*Hypertension
*hypervolemia
*hemolusion.

ورنه اعلى
[↑ Fluid]

"Complications of Subarachnoid hemorrhage"

① * **REBLEEDING** (killer)

- 1st day 4%, then 1.5 % /d For First 14 day
- Mortality rate is **70%**
- 15-20% within 2 w
- **50% will bleed within 6 m**
- **3% will bleed annually with 2% mortality**
- **50% of deaths occur in the 1st m**
- **Early surgery prevents rebleeding**

cause of death before reaching the
seizure : asphyxia
not stopped bleeding

hospital.

② Vasospasm

- Commonly seen after aneurysmal SAH but may occur with trauma
- Never before day 3 post SAH .
- peak day 5-7 * up to 21 day
- The most significant cause of M & M in patient surviving SAH long enough to reach medical care
- Mortality rate is 7%, severe morbidity 7%
- Blood clot is spasmogenic when indirect contact with the proximal 9 cm of ACA, MCA [ICA]
- base of the skull The higher grade, the higher risk. Hunt + Wis.
- ✓ The more blood on CT scan the more risk Fisher [radiological]

continued

- ✓ Clinical vasospasm: 20-30% of patients. symptoms usually develop gradually.
- Criteria: increased symptoms headache and lethargy, new focal deficits, or hyponatremia
- ACA > MCA .
- ✓ Radiological vasospasm : 30-70%. Arterial narrowing demonstrated on angiogram with slowing of contrast filling

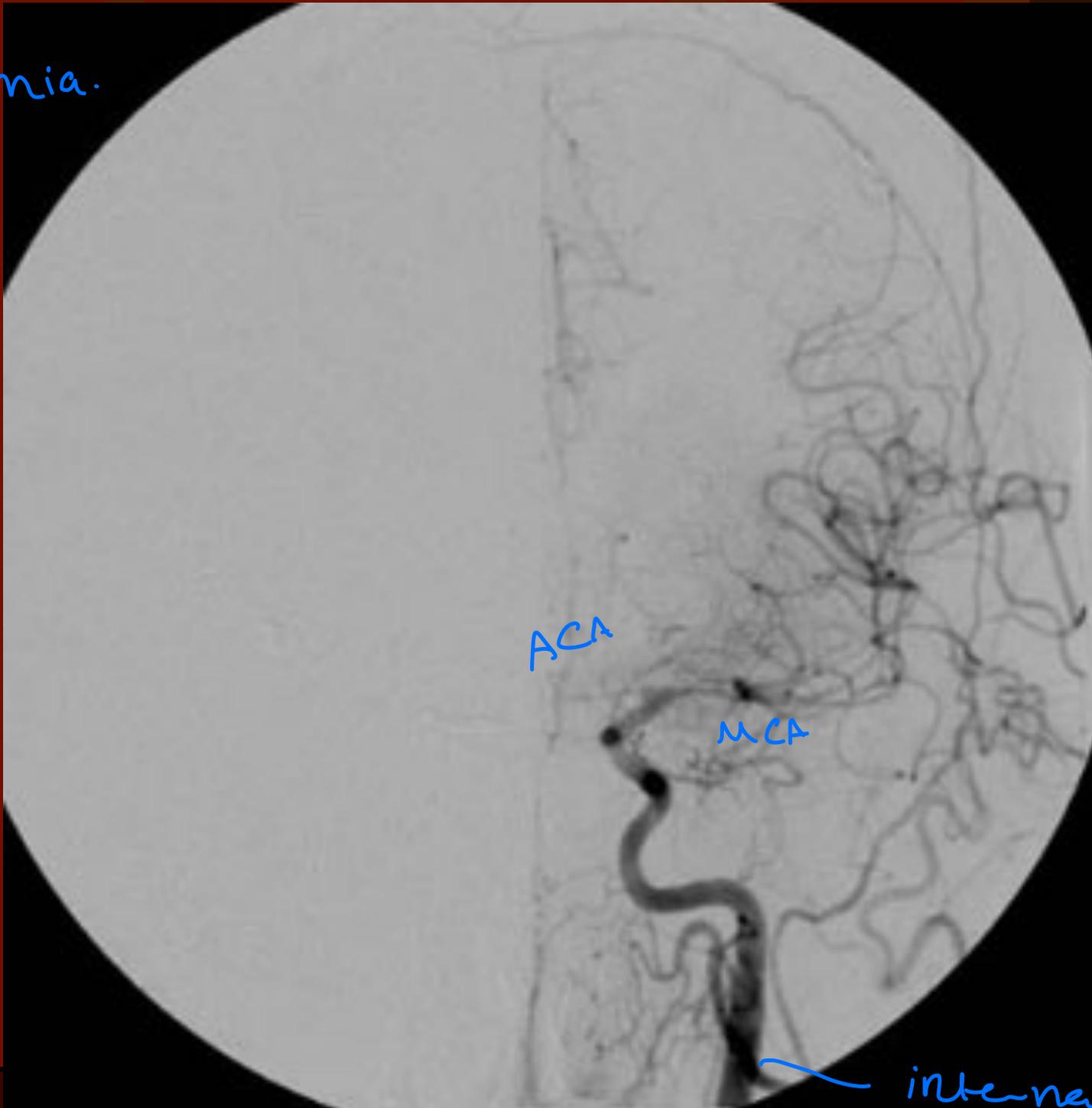
⊗ أي New symptom على مريض SAM ينبغي

vasospasm بعد اليوم الثالث - ex: seizure vomiting -

headache .

*ischemia.

*severe
vasospasm
ON ACA-



ACA

MCA

internal carotid

Pathogenesis

- Poorly understood
- Contraction of the smooth muscle as a result of the vasoconstrictors or vasoactive substances released into the CSF.
- Neuronal mechanism via nervi vasorum as a result of sympathetic hyperactivity. *posterior hypothalamus have a part responsible for the sympathetic activity
- Impairment of endothelial derived relaxant factor.
- Mechanical phenomenon *stretching of arachnoid fiber *direct compression on blood clot.
- Components implicated :oxyhemoglobin, iron, noradrenalin, thromboxane-A2 and free radicals

SAH ←
hypothalamus
ذلك بجزء الـ sympathetic discharge
Circle of Willis
3rd ventricle
SAH ←

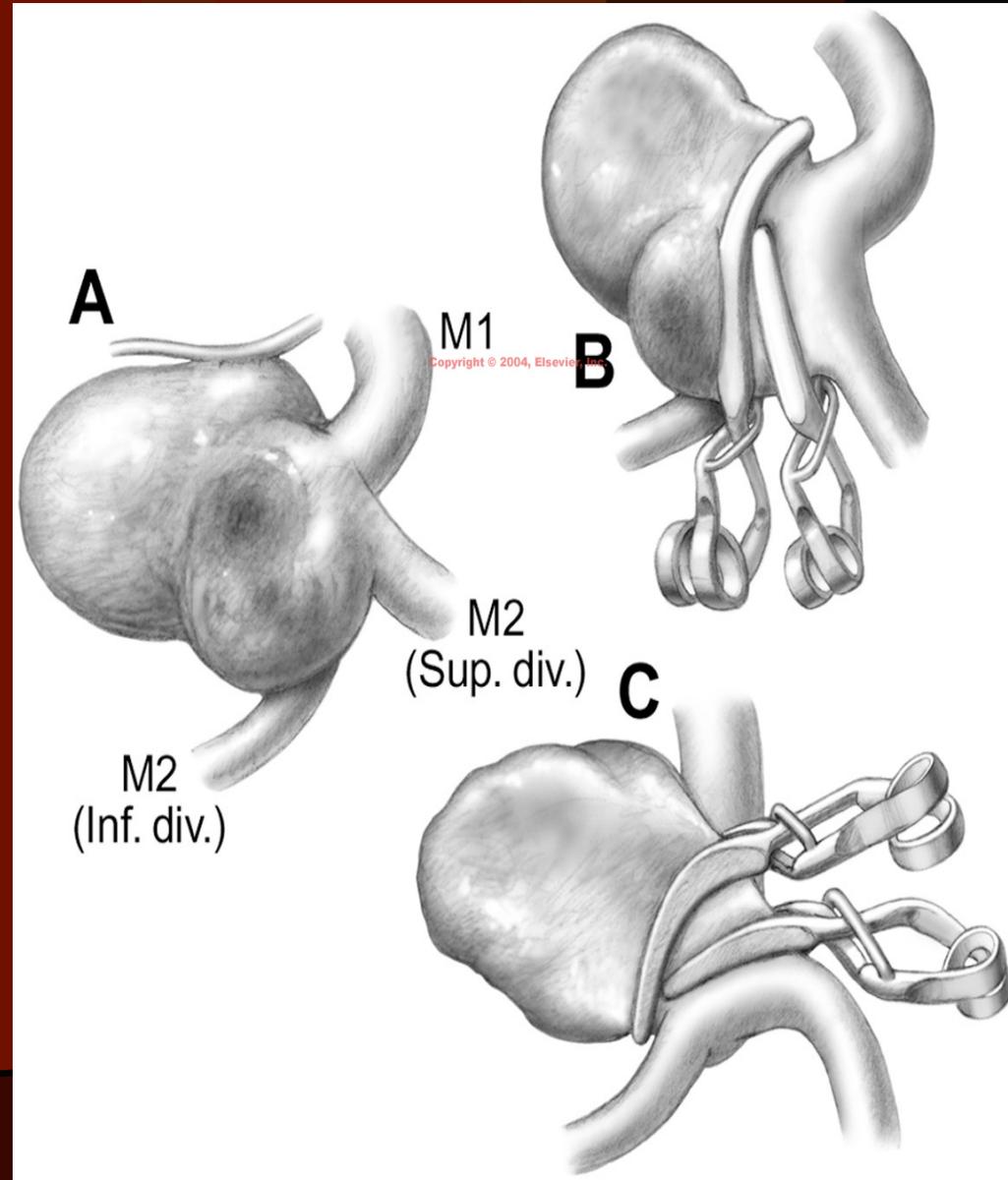
CT → to rule out new events.

Management for vasospasm

- → Non contrast CT scan to rule out hydrocephalus, oedema, infarction or rebleed
 - Electrolytes and ABGs → maybe cause of seizure
 - Angiogram?, gold standard.
 - Transcranial doppler?
 *يكون السرعة - كل ما قل القطر، كل ما زادت السرعة.
 يعني اذا زادت السرعة ← vasospasm*
 - Calcium channel blockers Nimodipine vs Nicardpine for 21 days.... May improve the outcome, more beneficial in neuroprotection than in preventing vasospasm
 - 3 H Protocol
 - Dexamethasone
 - Balloon angioplasty *sterik.*
 - Intra-arterial papaverine *intraarterial*
 - ICP monitor *يمكن اعطى*
- nimodipine*
- most effective → Intraarterial Calcium Channel*

Treatment options

- Best treatment depends the patient's condition, anatomy of the aneurysm, ability of the surgeon
- Clipping of the aneurysm at the neck to exclude it from the circulation is considered the optimal treatment
- Goal of surgery to prevent rupture or further enlargement while preserving all normal vessels and minimizing injury to brain



ما لازم تقرب على اد aneurysm قبل لا
 تقرب من origin
 proximal ← control

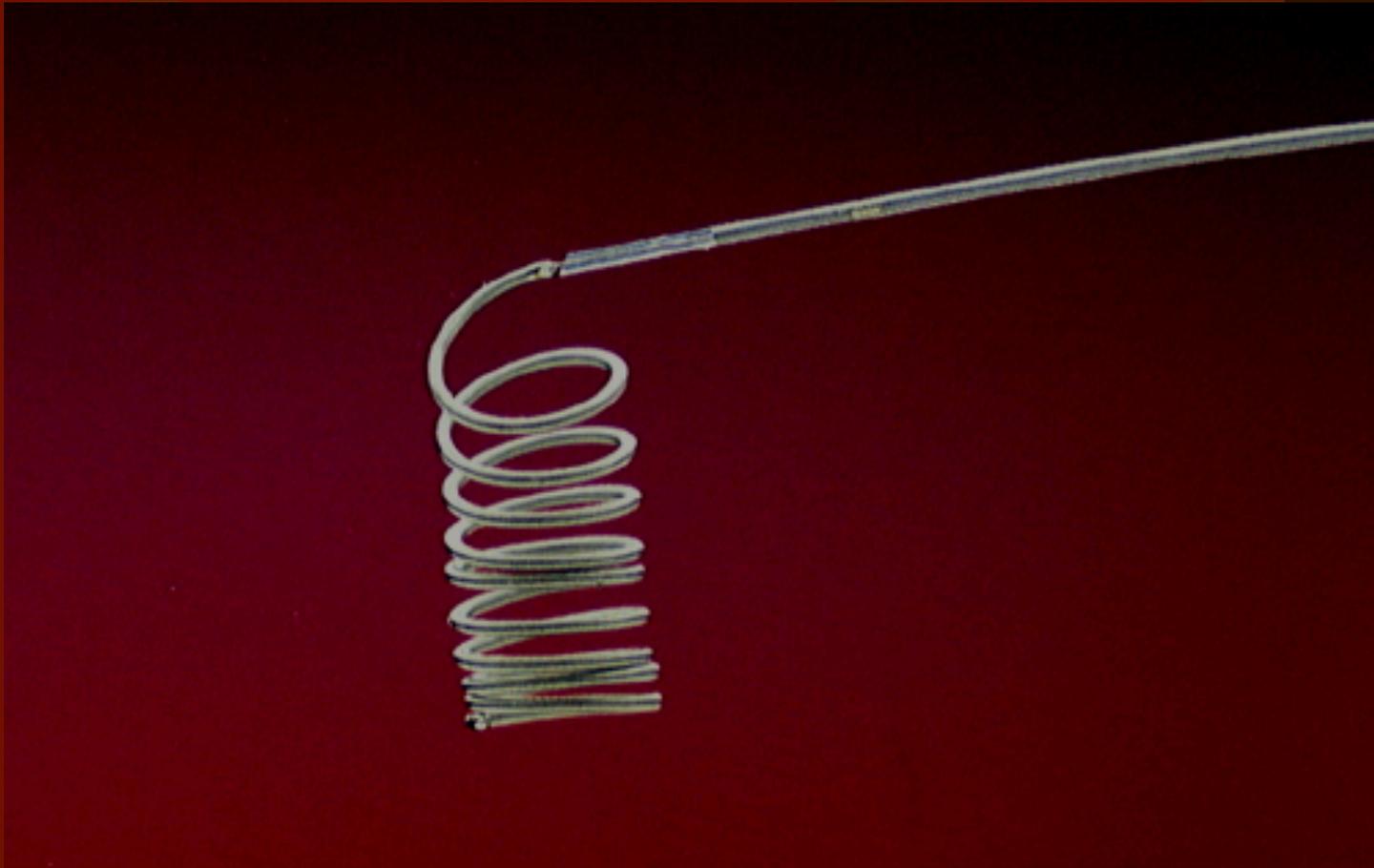
MCA origin → at the Sylvian Fissure.

Catheter.

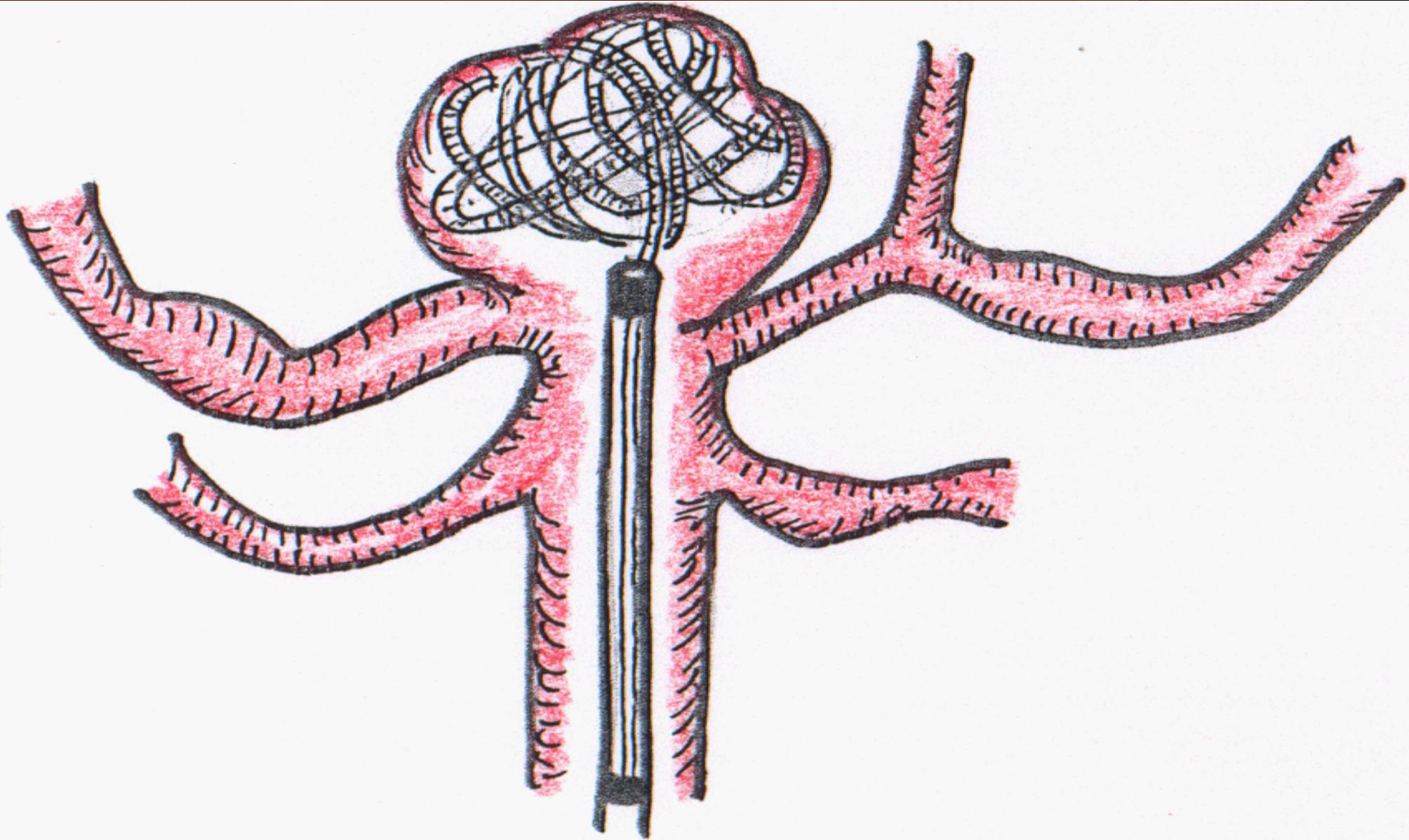
Endovascular coiling:

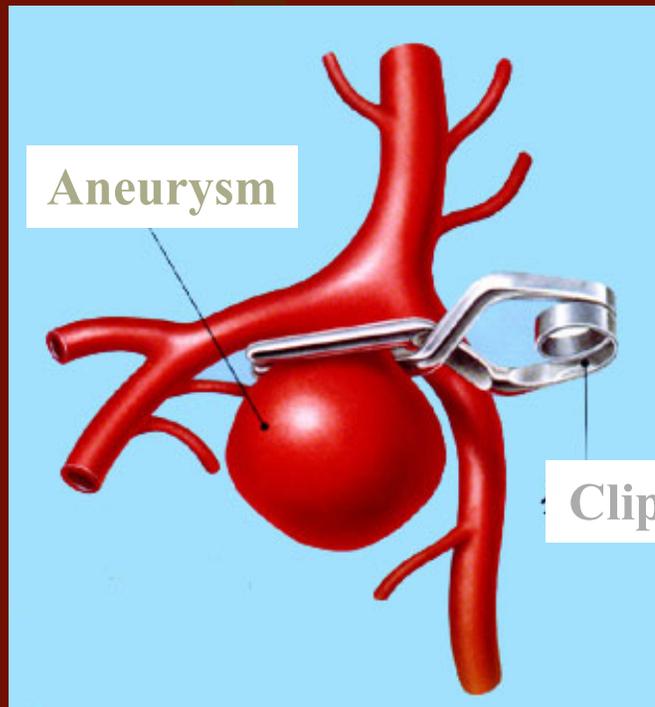
- Better for posterior circulation aneurysms
- Better for high grade pts
- Recanalization is greater
- Higher incidence of rebleeding
- Long term data not available

Coiling



coiling





- Craniotomy
- Locate artery
 - Place clip

*indication of the surgery :-

Factors that favor surgical clipping:

1. younger age group (low risk for surgery and lower lifetime risk for recurrence).

old age → poor prognosis

2. MCA bifurcation aneurysm. →

easy access

3. giant aneurysm (>20mm). → mass effect.

4. symptoms due to mass effect.

5. small aneurysms (<1.5-2 mm). — coil

6. wide neck aneurysms.

ممكن يترك

turbulent blood flow
Coil ←
توربولنت
تدفق

لا تترك
vessel

↑ clot

Factors that favor coiling:

- ✓ 1. Elderly patients.
- ✓ 2. Poor clinical grade.
- ✓ 3. Posterior circulation aneurysms.
- ✓ 4. Aneurysm morphology:
 - * - dome-to-neck ≥ 2 . dome / neck ratio.
 - * - neck diameter < 5 mm.

clipping superior to surgery.

Timing of surgery

- Controversy exists between what so called Early surgery within first 3 days and late surgery after 10 days.
- **early** is advocated for following reasons
- Reduce the risk of rebleeding
- Facilitate treatment of vasospasm
- May remove potentially vasospasomgenic agents
- Factors favoring **early**:
- Good medical and neurologic condition
- Associated ICH
- Rebleeding or imminent rebleeding

angry brain * ٥ أهوت ك



CONTINUED

- Against early brain is red and swollen,
- may increase vasospasm, high incidence of rebleeding
- Factors favoring late
- Poor condition
- Difficult aneurysm because of site and size

Giant aneurysms

- Less than 1 cm is small
- 1-2.5 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
- Angiogram often underestimates the actual size because of the thrombus
- CT, MRI with and without contrast are more informative

TIA → showering of emboli ⊛

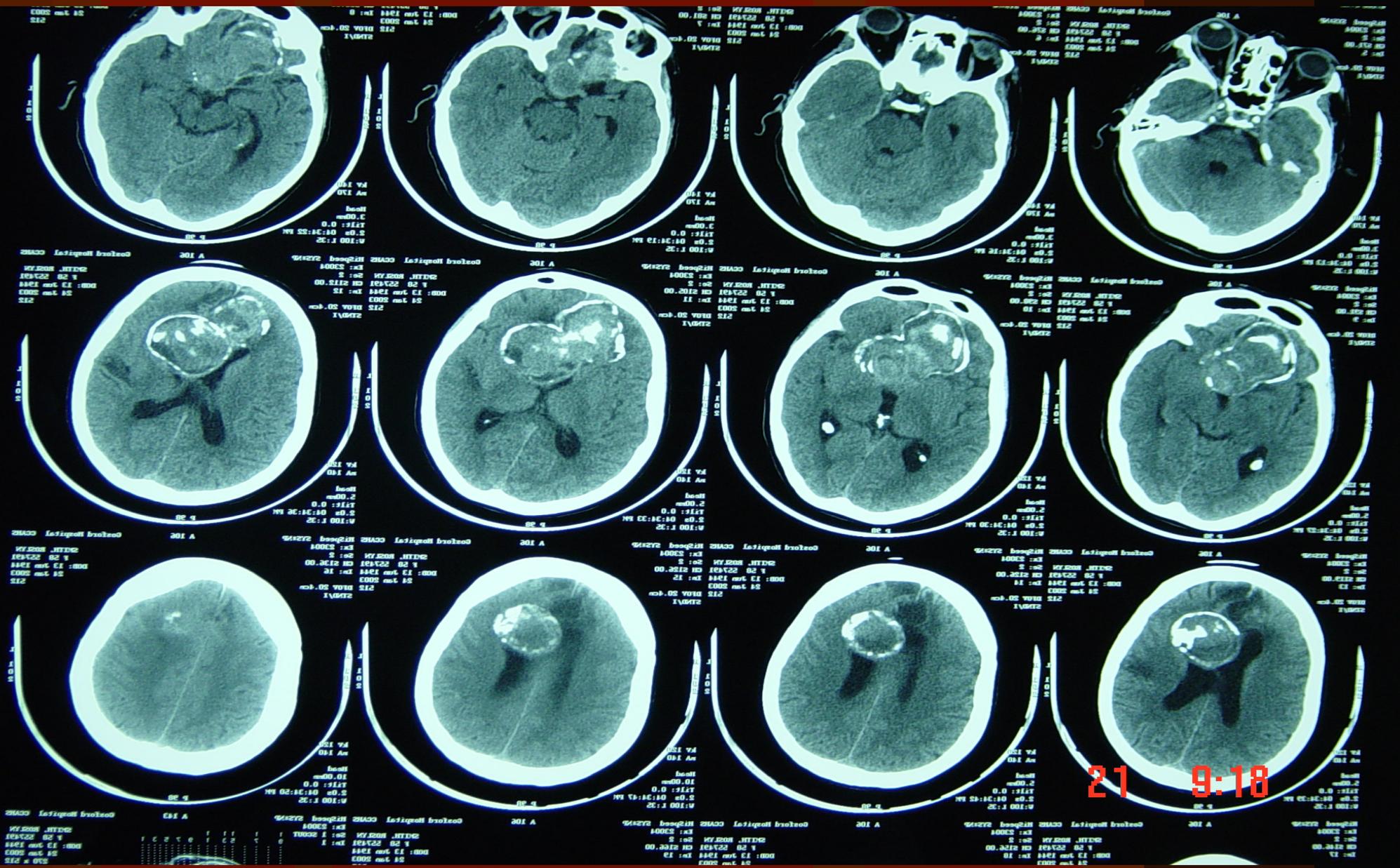
- ✓ **Treatment options are variable:**
- → direct ⊛ clipping is the ideal if applicable, clipping with *gold standard → zero risk of rebleeding.*
- → EC-IC ICA bypass, trapping, ligation *Flow diverting stent (Feistral-ed).*

GIA

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% calcified giant aneurysm contain thrombus
obstructive hydrocephalus



21 9:18

Hydrocephalus / calcification, no bleed

