MAYO CLINIC

Inquadramento Clinico del Malato con ESA ed indicazione alla DVE

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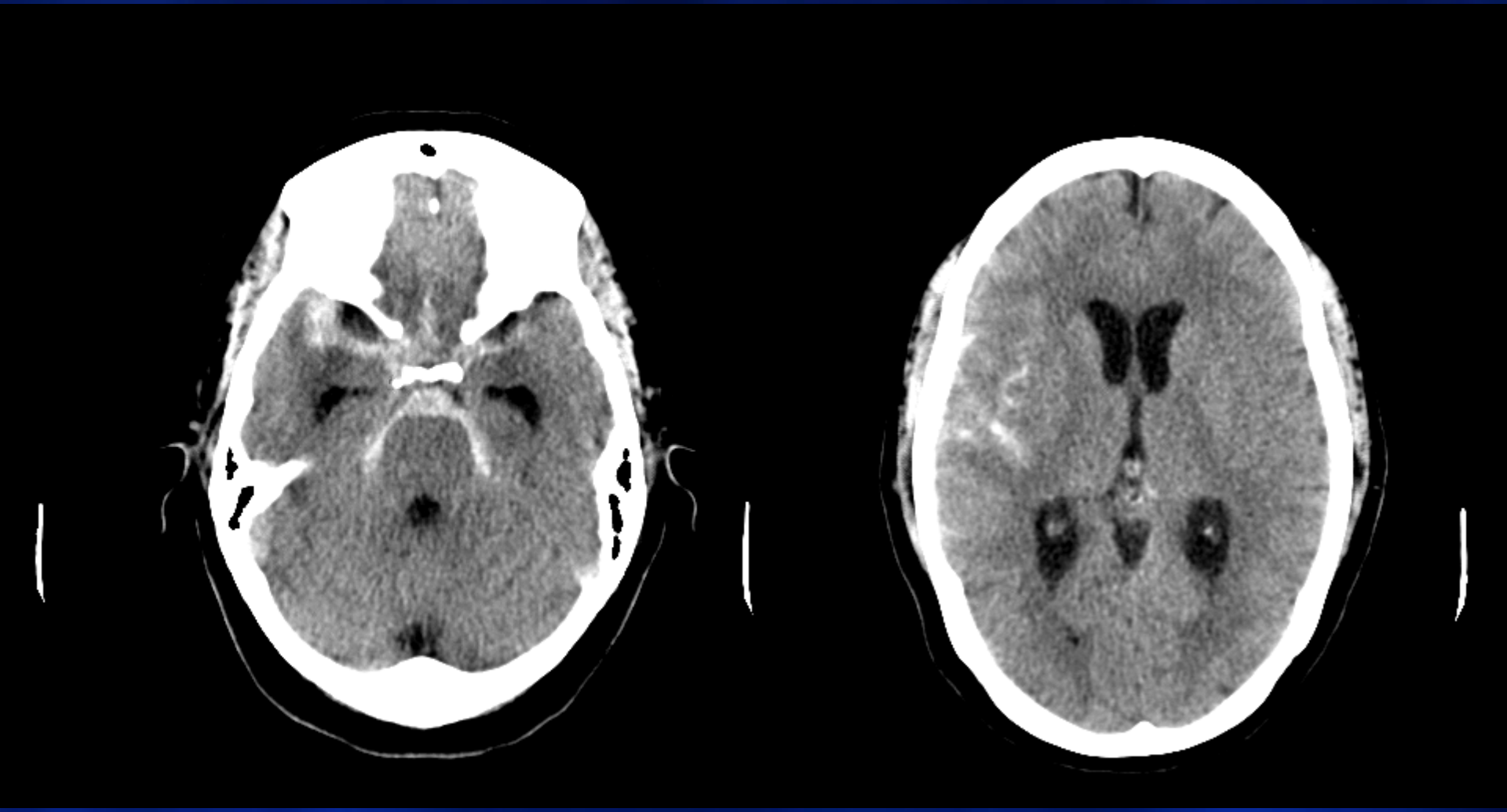
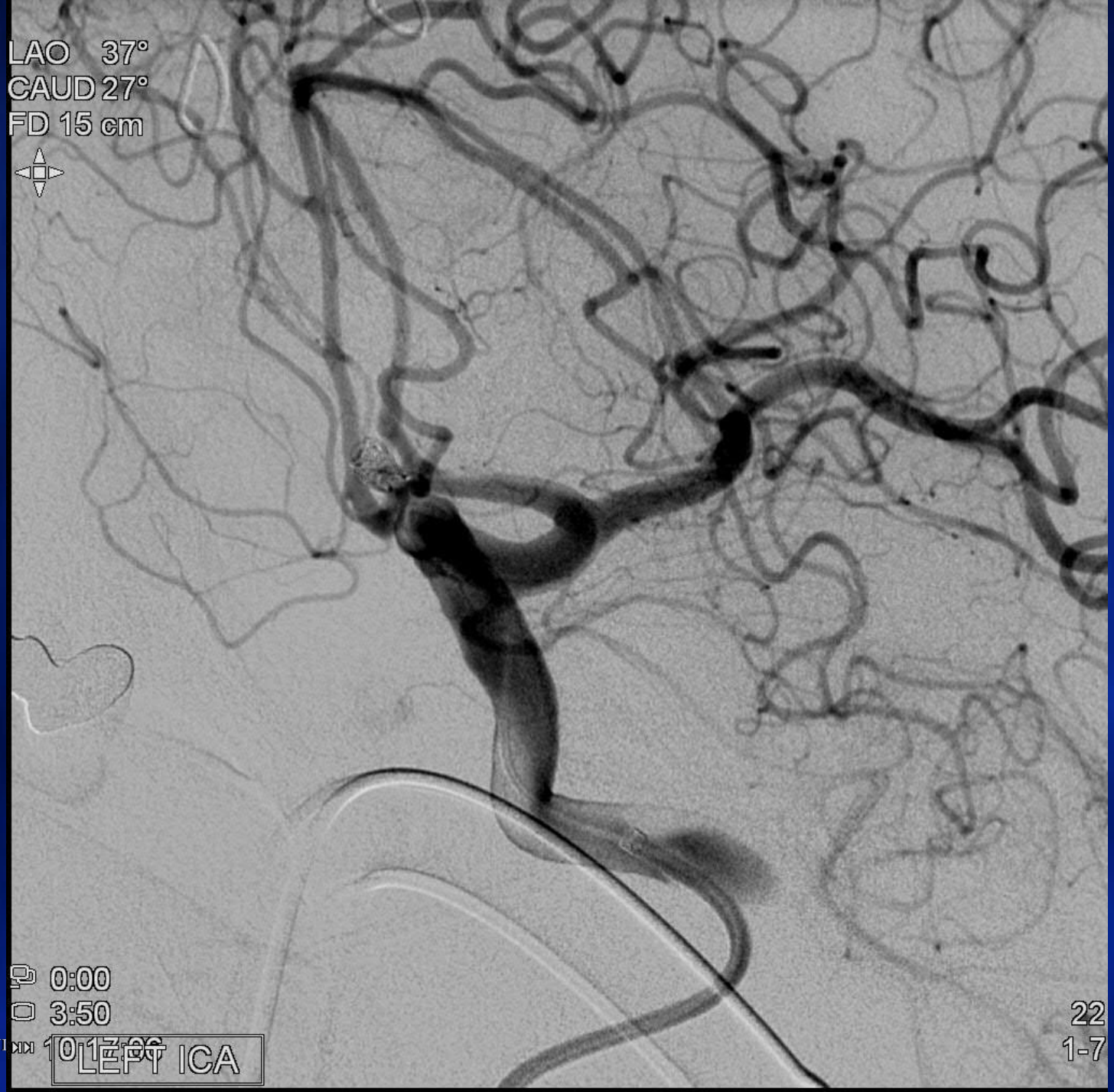
SAH: A Controversial View

April

- 81 year-old with sudden onset of headache.
- Awake and follows commands but easily falls asleep.




Mestad, Christiane
Date of Birth: 1934/04/02, Female
Patient ID: 02-096-814
Study ID: 17997861-1
Exam Date: 2015/03/30
Rot: RAO 125°
Ang: Cran 30°
Head Side
Mayo Clinic
Run Number: 5005
Volume Type: 3DRA
Run Date: 2015/03/30
Run Time: 09:11:48
Cube Size: 104.84 mm
Quick Measurement 1 5.12 mm
Quick Measurement 2 2.78 mm
Quick Measurement 3 1.98 mm


LAO 37°
CAUD 27°
FD 15 cm
0:00
3:50
LEFT ICA
22
1-7

September

- Back to normal activities

Outcome

- Patients with good neurological grade after aSAH (Hunt-Hess I to III and those in grade IV who improve after CSF diversion) are expected to return to a normal level of functioning after a few weeks.

Stuiale CL, Lanzino G: Improving Cognitive Dysfunction After Aneurysmal Subarachnoid Hemorrhage. World neurosurgery, 2013.

Outcome after aSAH

- If this does not happen, it is usually because of mistakes made along the way and not necessarily because of the primary effect of aSAH or vasospasm, which have been used too often to mask inadequate management.

Sturiale CL, Lanzino G: World Neurosurgery, 2

Aneurysmal SAH

- Sudden extravasation of blood in the subarachnoid space
- Arachnoid very resistant to stretch.


6 Pack

Aneurysmal SAH

- Massive sudden increase in intracranial pressure (ICP)
- Intracranial pressure equals perfusion pressure=transient no flow= bleeding stops

Often it is "EXTRAPARENCHYMAL" not a BRAIN ISSUE

Treatment of Aneurysmal SAH

- **Prevent Secondary Damage**

- **The old concept to wait for deterioration of level of consciousness before doing CSF diversion is wrong and primitive**

Old Concepts

- The ventricles are not enlarged

- From Bailes J, Spetzler RF, 1991

TABLE 4

Intracranial pressure (ICP) related to hydrocephalus (ventriculocranial ratio) in 30 patients

ICP ($cm\ H_2O$)	None (< 0.16)	Mild (0.16–0.20)	Moderate (0.21–0.25)	Severe (> 0.25)
< 20	0	2	0	0
20–29	0	0	1	0
30–39	8	1	6	2
≥ 40	4	1	5	0
total cases	12	4	12	2

- **Ventricles size is NOT an INDICATION of INTRACRANIAL pressure!!!!!**

Old concepts

- Patient is sleepy but follows commands
- Awake patients with “just” headache after SAH can easily have ICP 30-40

ICP IN SAH

- Neglected concept
- When considered, concepts developed in the management of trauma patients were applied

- **Nutritive exchanges occur at the capillary level**

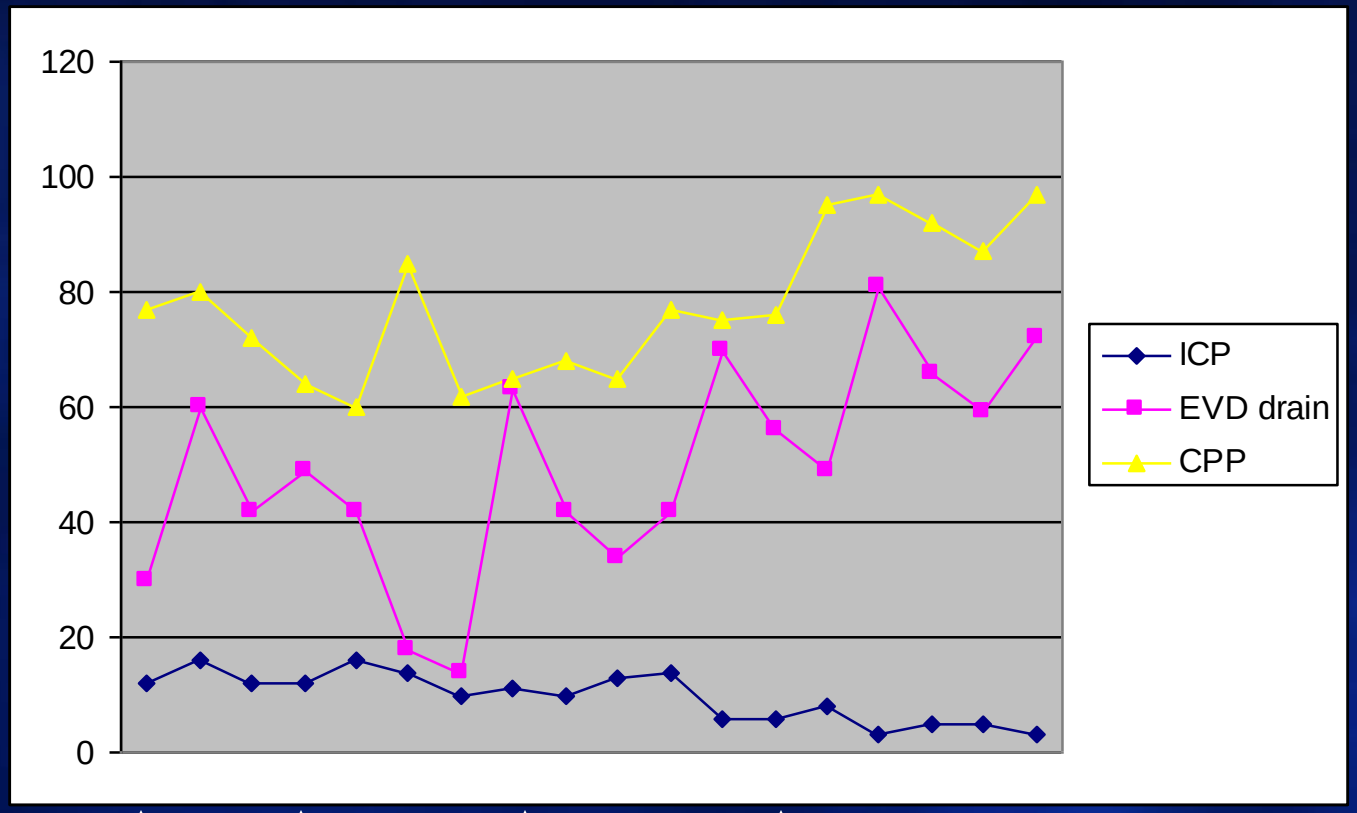
- Pressure in the capillaries is
  - 25 mm Hg

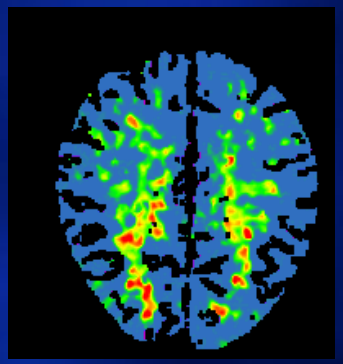
- **Emerging role of the subarachnoid space and the glymphatic system in nutrient exchanges**

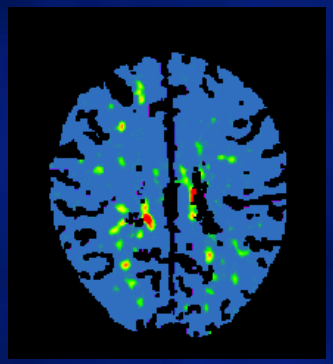
Increased ICP

Increased intracranial pressure results in higher transmural pressure and decreases regional flow

Increased transmural pressure + vasospasm= ischemia


120
100
80
60
40
20
0
ICP
EVD drain
CPP
9/5
9/6
9/7
9/8
EVD dropped





Criteria for Placement of EVD

- Coma or decreased level of consciousness
- Intractable headache
- Evidence of hydrocephalus
- Evidence of brain swelling at surgery
- Just if you think about

Correction of Increased intracranial Pressure

- External ventricular drainage.
- Lumbar Drainage

When in relation to possible procedure?

- Consider clinical condition
- Difficult aneurysm?
- It is a bedside procedure

- It is a delicate procedure
- Not the least experienced operator!!!!

Immediate correction of ICP results in:

- Drammatic improvement of Headache
- Normalization of Blood Pressure
- Normalization of Serum Glucose

Vasospasm

- One of the most studied neurosurgical issues

Nimodipine:

- Improves outcome but no effects on angiographic vasospasm compared to placebo
- Improvement of microcirculation spasm?
- Neuroprotective effect?

Clazosentam (CONSCIOUS)

- Significantly reduces vasospasm
- No effect on outcome

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Cerebral vasospasm following subarachnoid hemorrhage: time for a new world of thought

Ryszard M. Pluta, **Jacob Hansen-Schwartz**, **Jens Dreier**, **Peter Vajkoczy**, **R. Loch Macdonald**, **Shigeru Nishizawa**, **Hideotoshi Kasuya**, **George Wellman**, **Emanuela Keller**, **Alois Zauner**, **Nicholas Dorsch**, **Joseph Clark**, **Shigeki Ono**, **Talat Kiris**, **Peter LeRoux**, and **John H. Zhang**

REVIEW

www.nature.com/clinicalpractice/neuro

Cerebral vasospasm after subarachnoid hemorrhage: the emerging revolution

R Loch Macdonald*, Ryszard M Pluta and John H Zhang

Vasospasm

- Beyond vessel size

Vasospasm

- Occurs between Day 4 and 14
- Peaks between Day 5 and 12

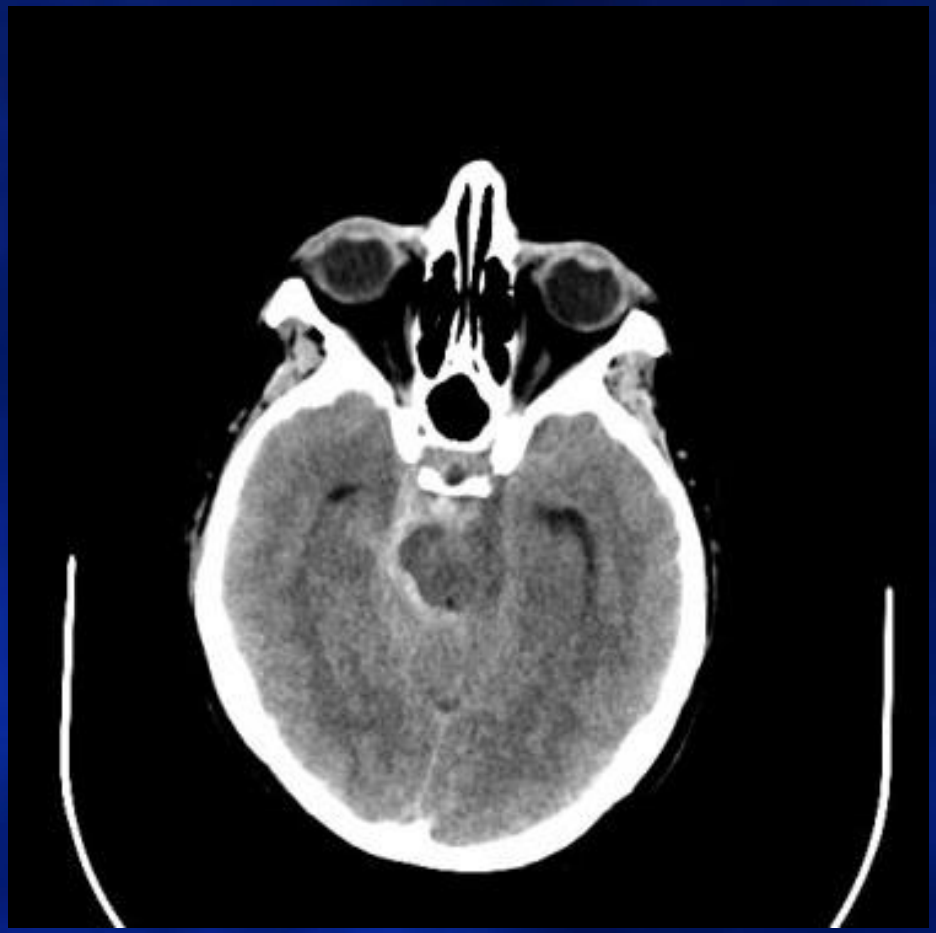
- After aneurysmal SAH patients are at risk of delayed deterioration with maximal risk between day 5 and 12 after the bleed.

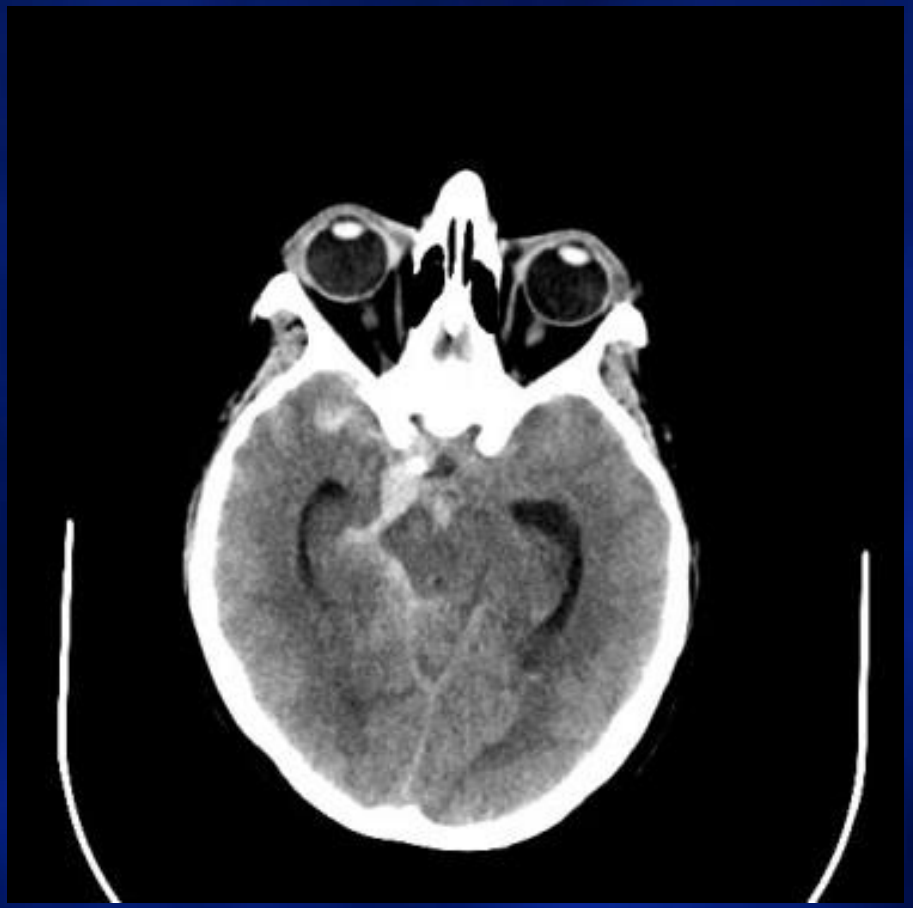
Vasospasm

- Between Day 5 and 12 patients are extremely sensitive to secondary insults

Neurological Examination

- Single most important tool to monitor patient condition






RAO 19°
CAUD 25°
FD 15 cm
0:00
3
RIGHT ICA
14:12:59
15
14-8


RAO 15°
CAUD 10°
FD 15 cm
2:50
3:50
14:52:01
RIGHT ICA

- 10 days ICU stay on “No touch” protocol

Vasospasm

- Onset of symptoms are often preceded by :
  - Spontaneous rise systemic pressure
  - Fever
  - Increased white count
  - Restlessness

- Faith of the EVD
- Clamp? Progressively raise it?
- The concept of lets see if the patient gets worse and if she does then we do something is **WRONG**

Take home message

- SAH results in increase of ICP
- Treatment of ICP is critical in preventing some of the neuropsychological effects attributed to SAH
- In order to improve microcirculation it is important to maintain transmural pressure and hence ICP very low

Perfect outcome in SAH

- The key is aggressive and prompt treatment of intracranial pressure
- SAH is different than head trauma
- You cannot apply the same criteria
- Decreasing ICP to very low level improves transmural pressure which improves capillary flow

- **Many patients with aneurysmal SAH can and MUST return to their pre-SAH functional status.**

Thank You