Department of Neurosurgery
University Medical Center of Pécs
HUNGARY

Malformation

Hudak Stephan

Agyi AVMek a populáció kb. 1%-ban fordulnak elő

AVM vérzési kockázat 2-3% /év

Így egy 25 éves beteg vérzési kockázata élete folyamán kb. 80%.

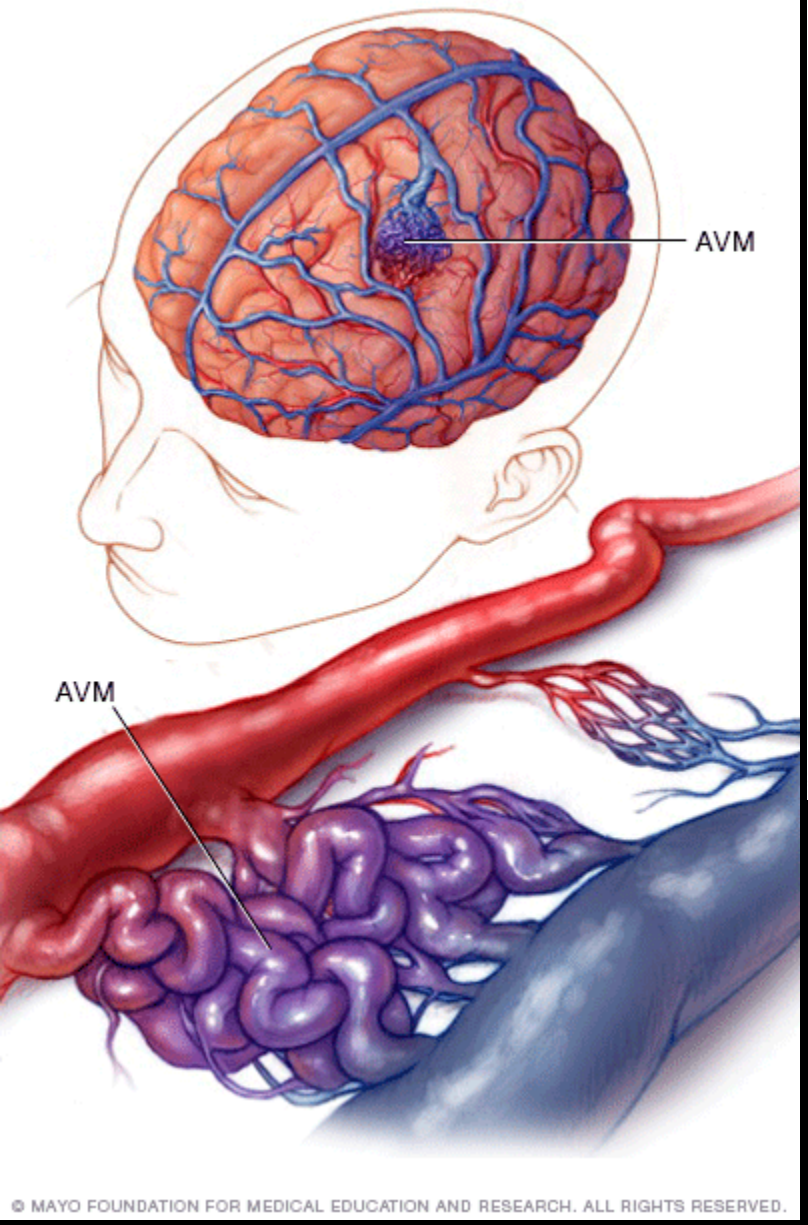
Minden 300 emberből kb 1-nek van AVM-ja.

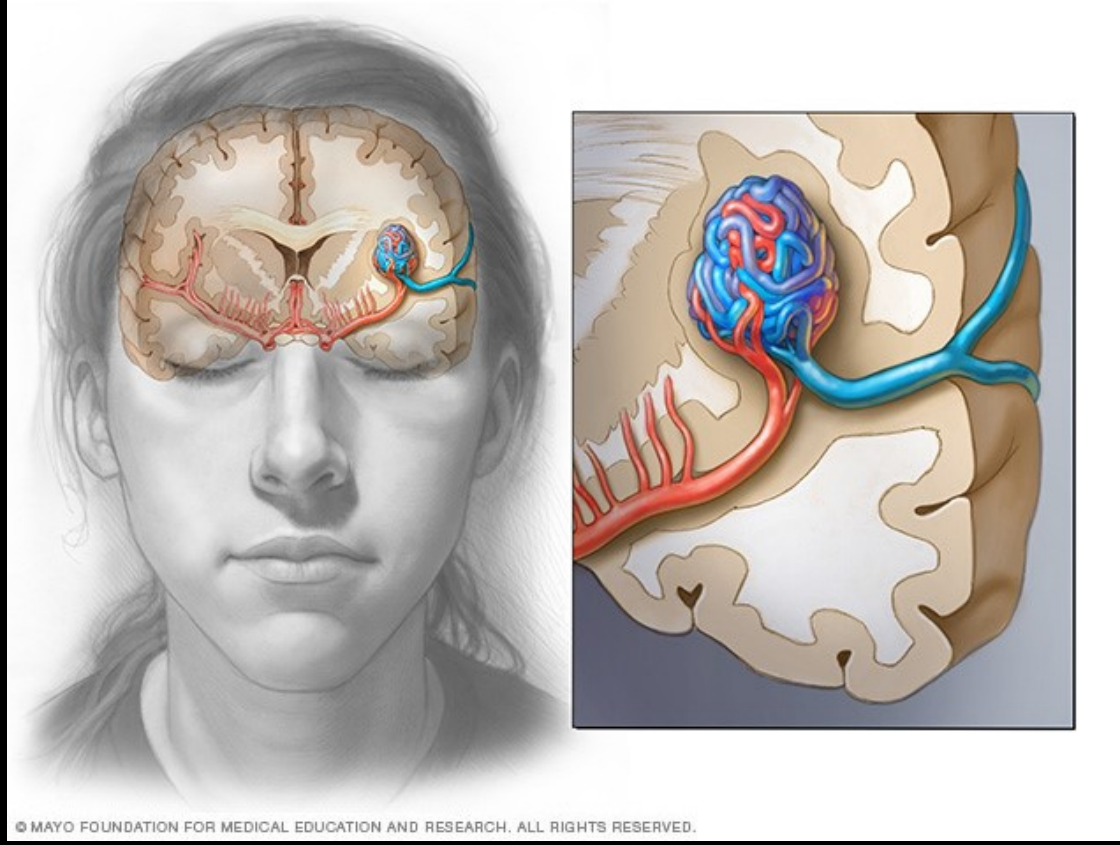
Az első vérzés mortalitása 10-30%.

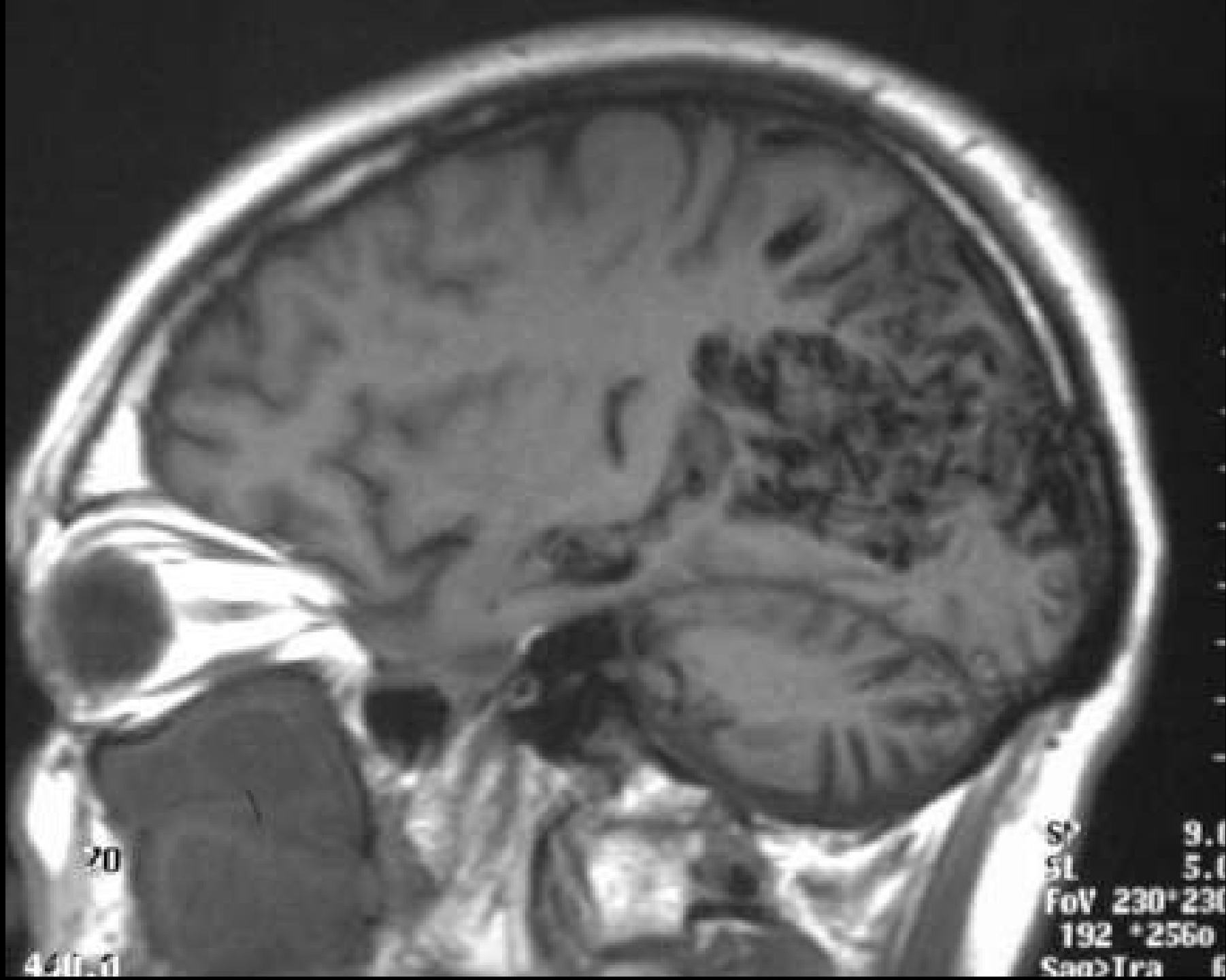
Morbiditás- 30 to 50%

Az AVM betegek 88%-a tünetmentes.

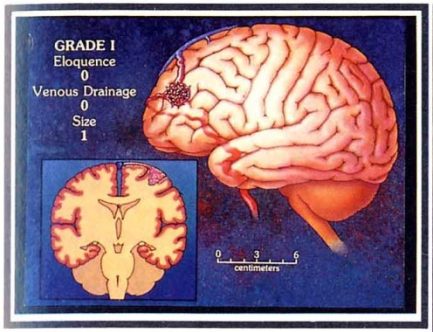
Ha az AVM vérzett, az újabb vérzés kockázata 9-szeres az első év folyamán






FoV 230*23
192 *256

GRADE I



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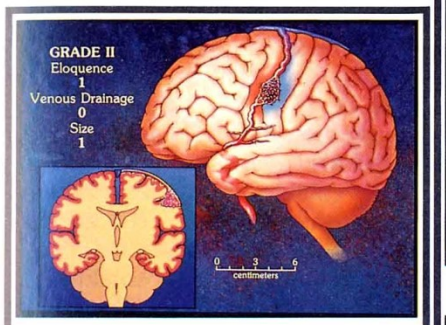

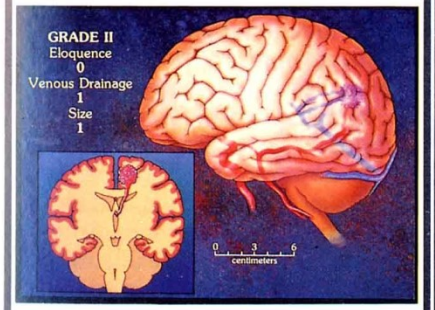

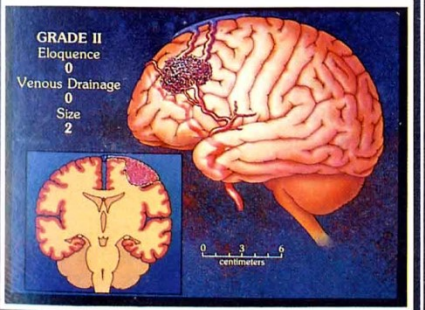

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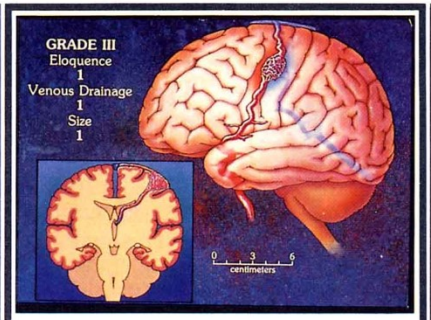

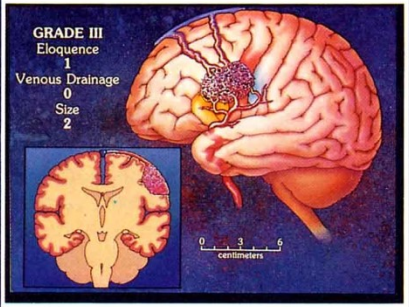

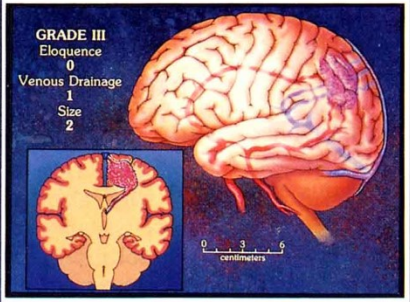

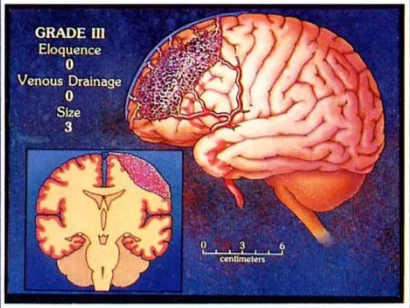

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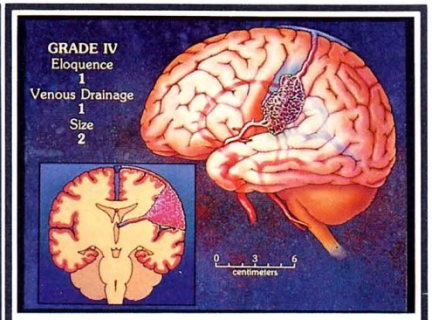

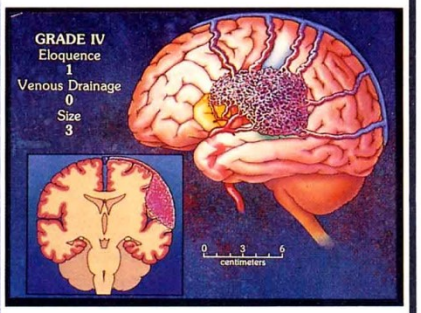

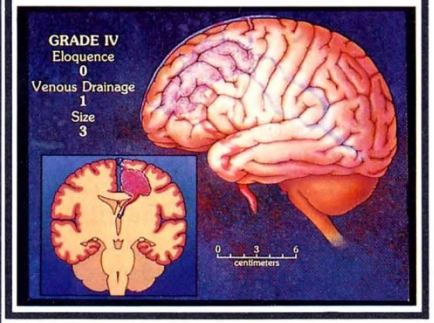

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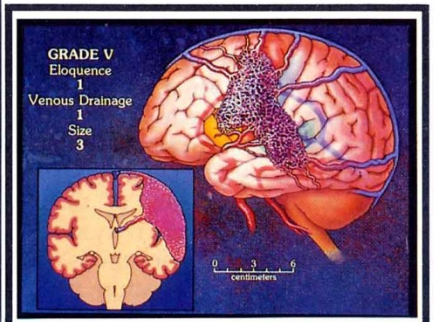
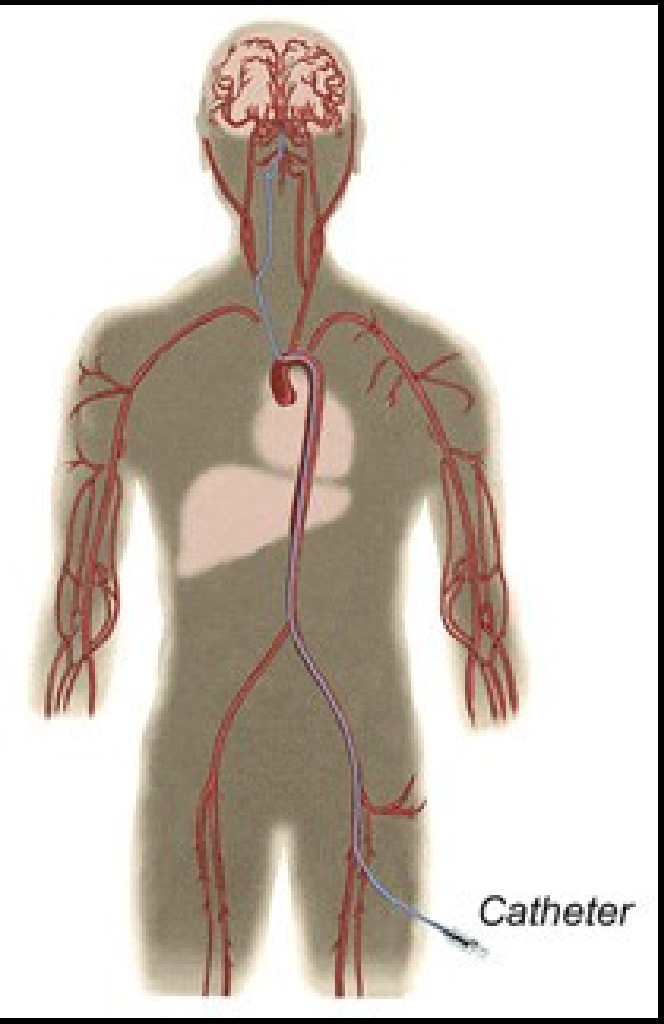
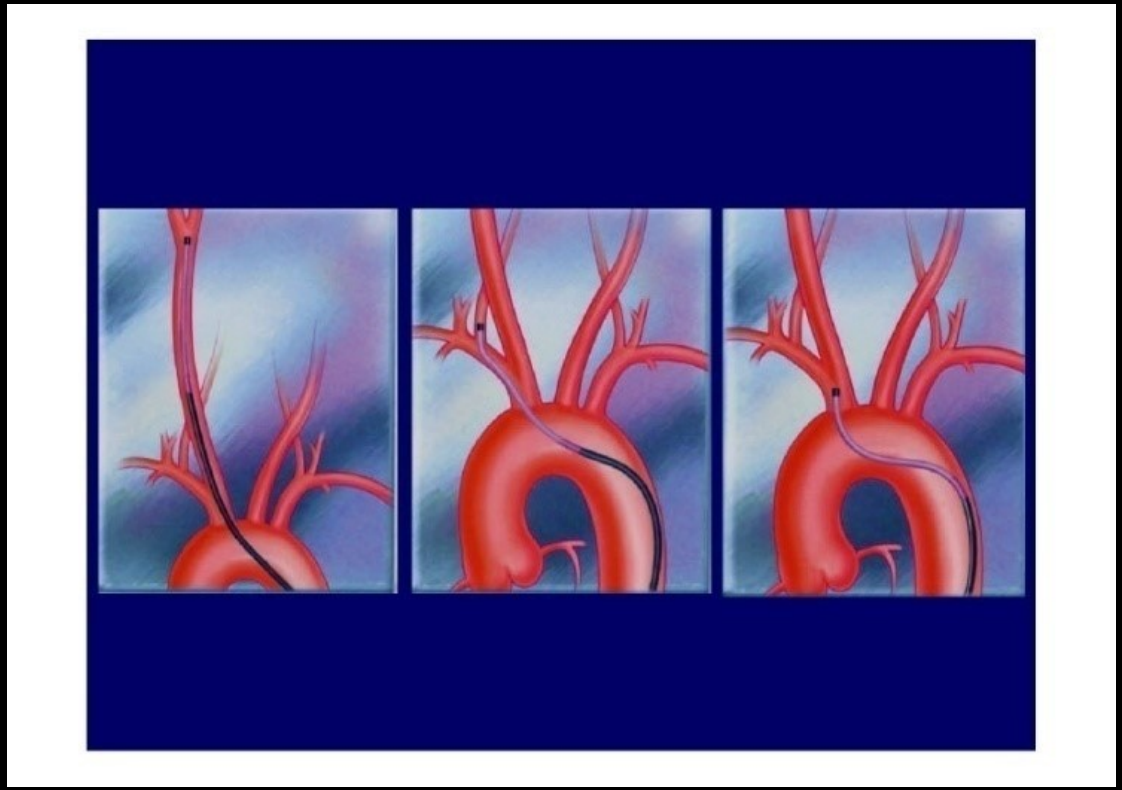
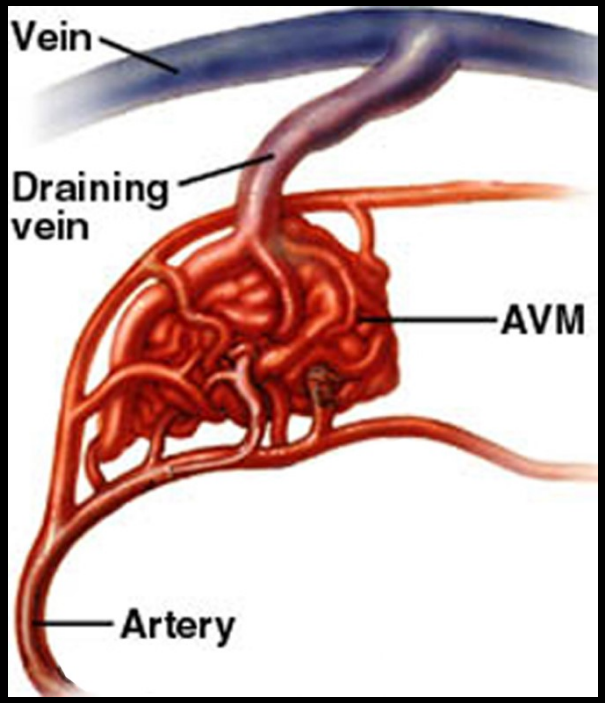


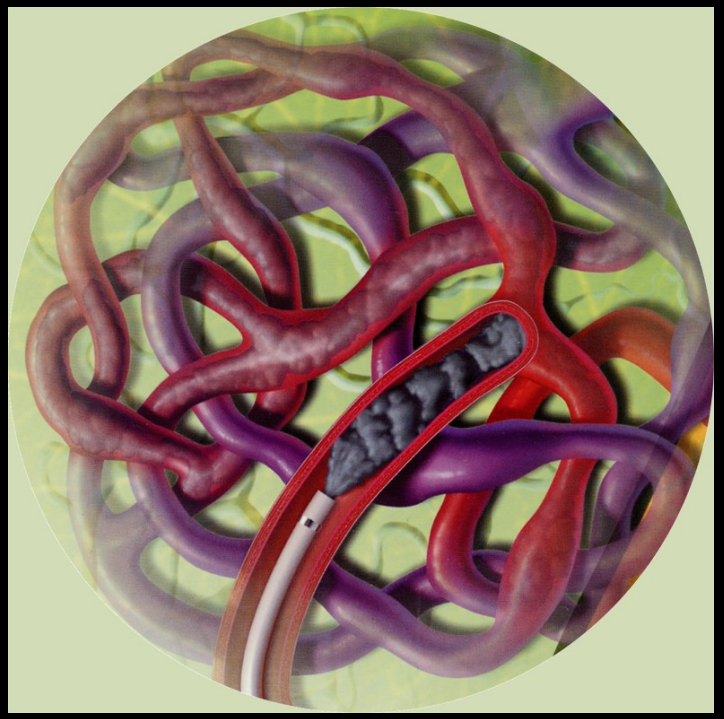
Érfejlődési rendellenességek kezelése

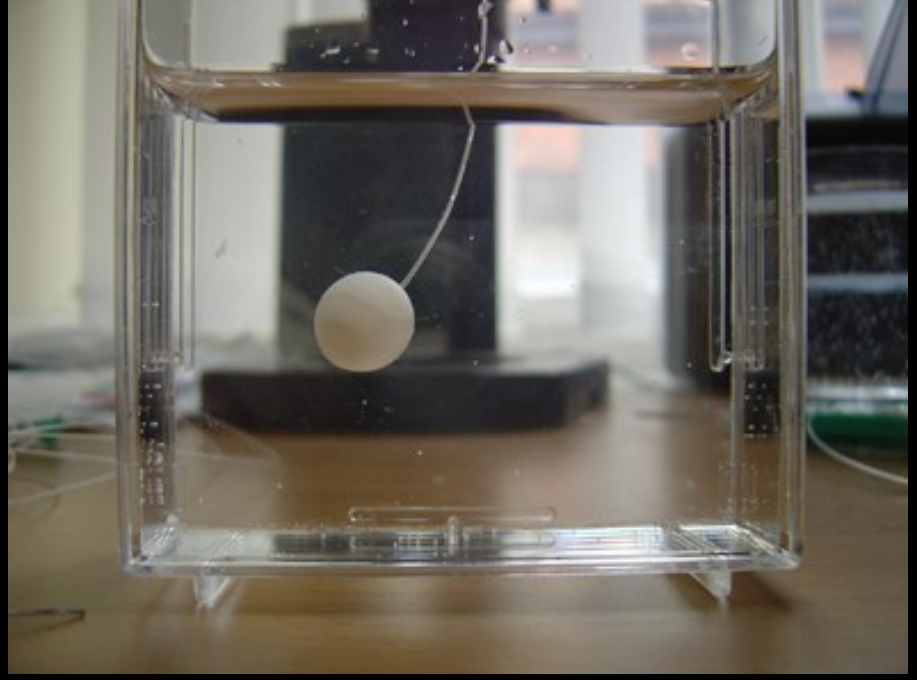




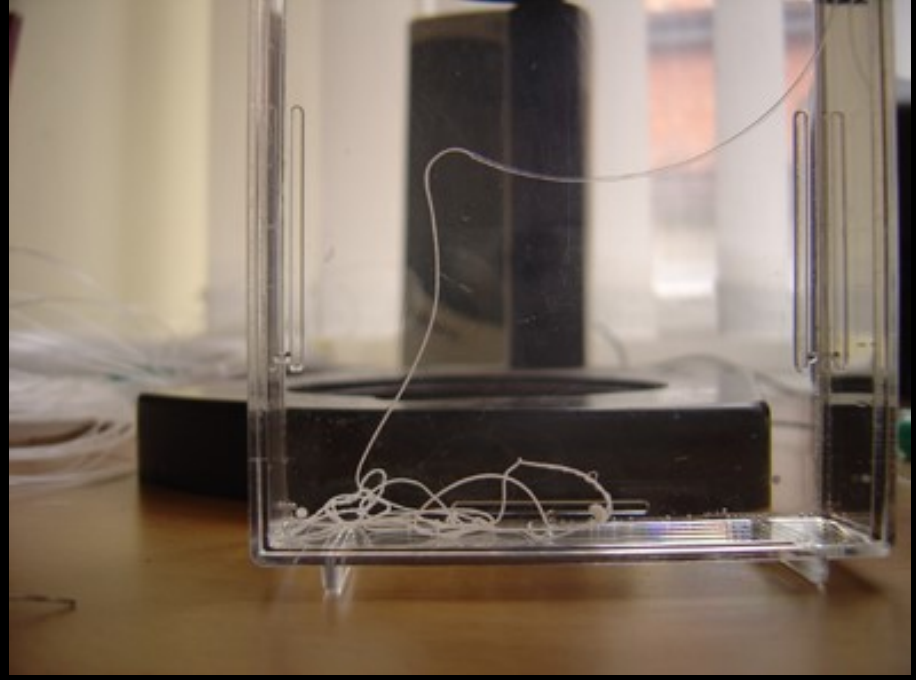
Liquid polymer



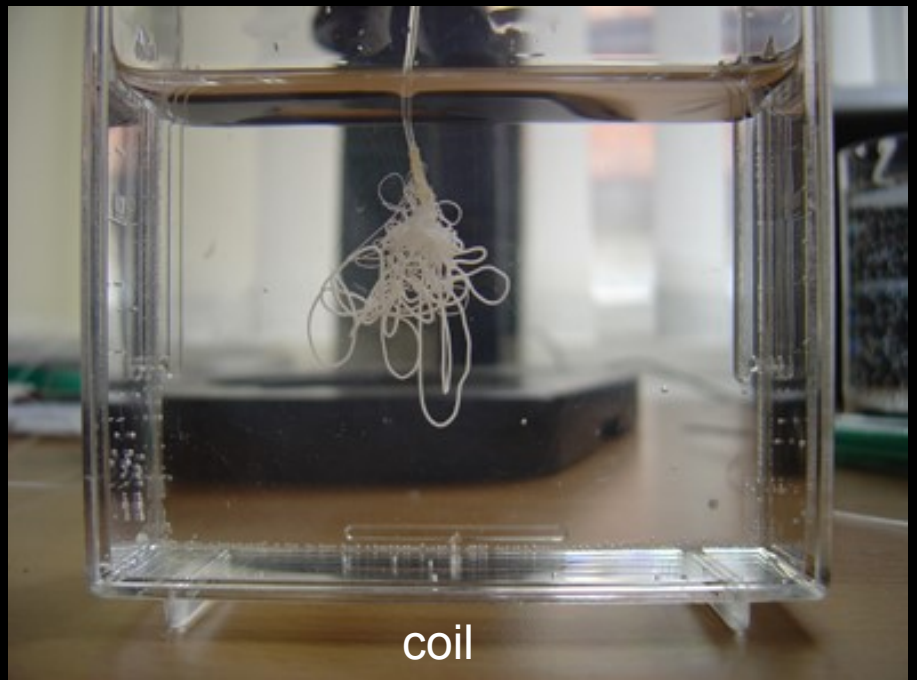




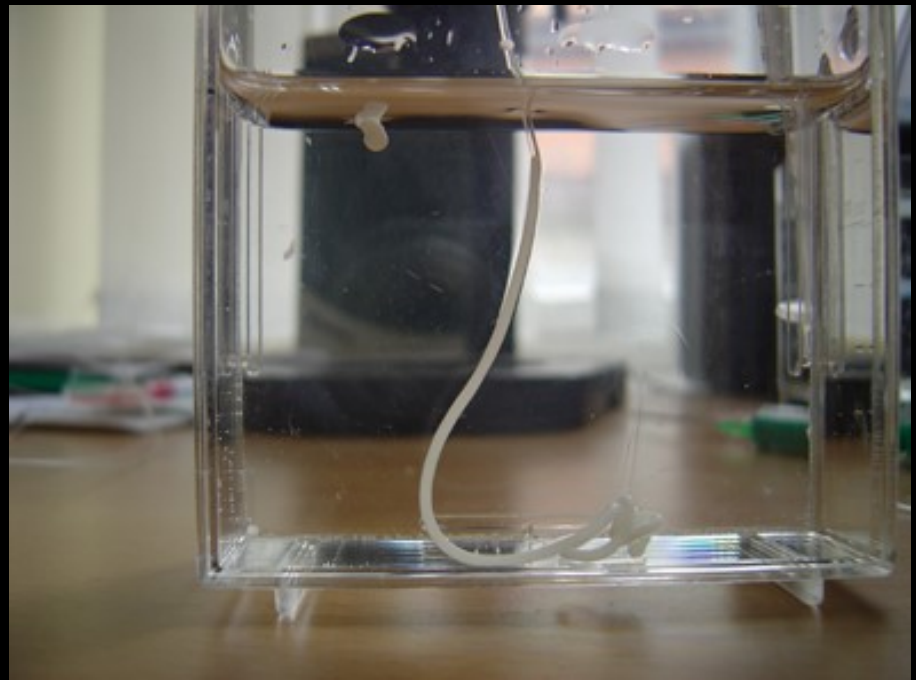
sphere



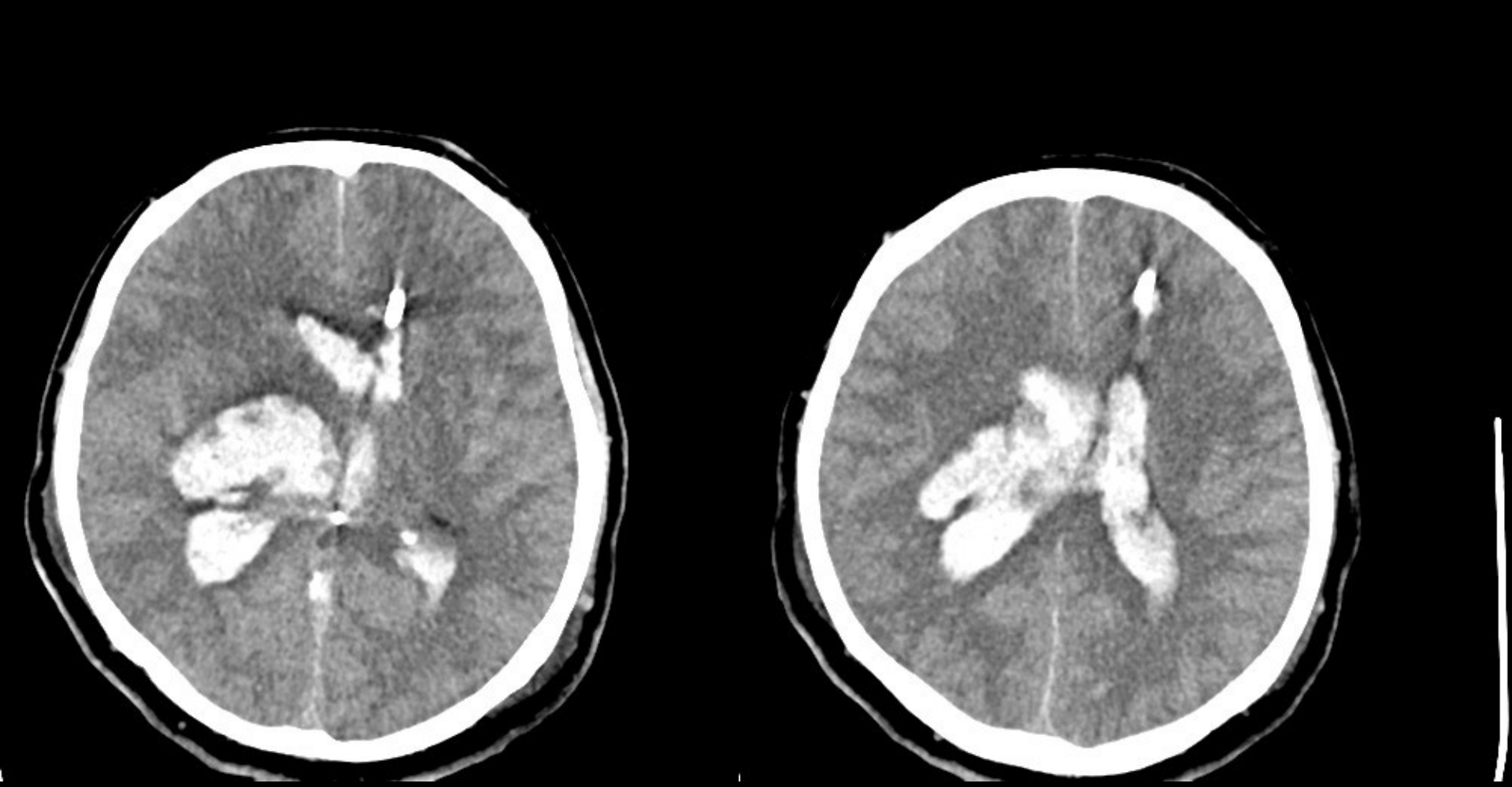
filament

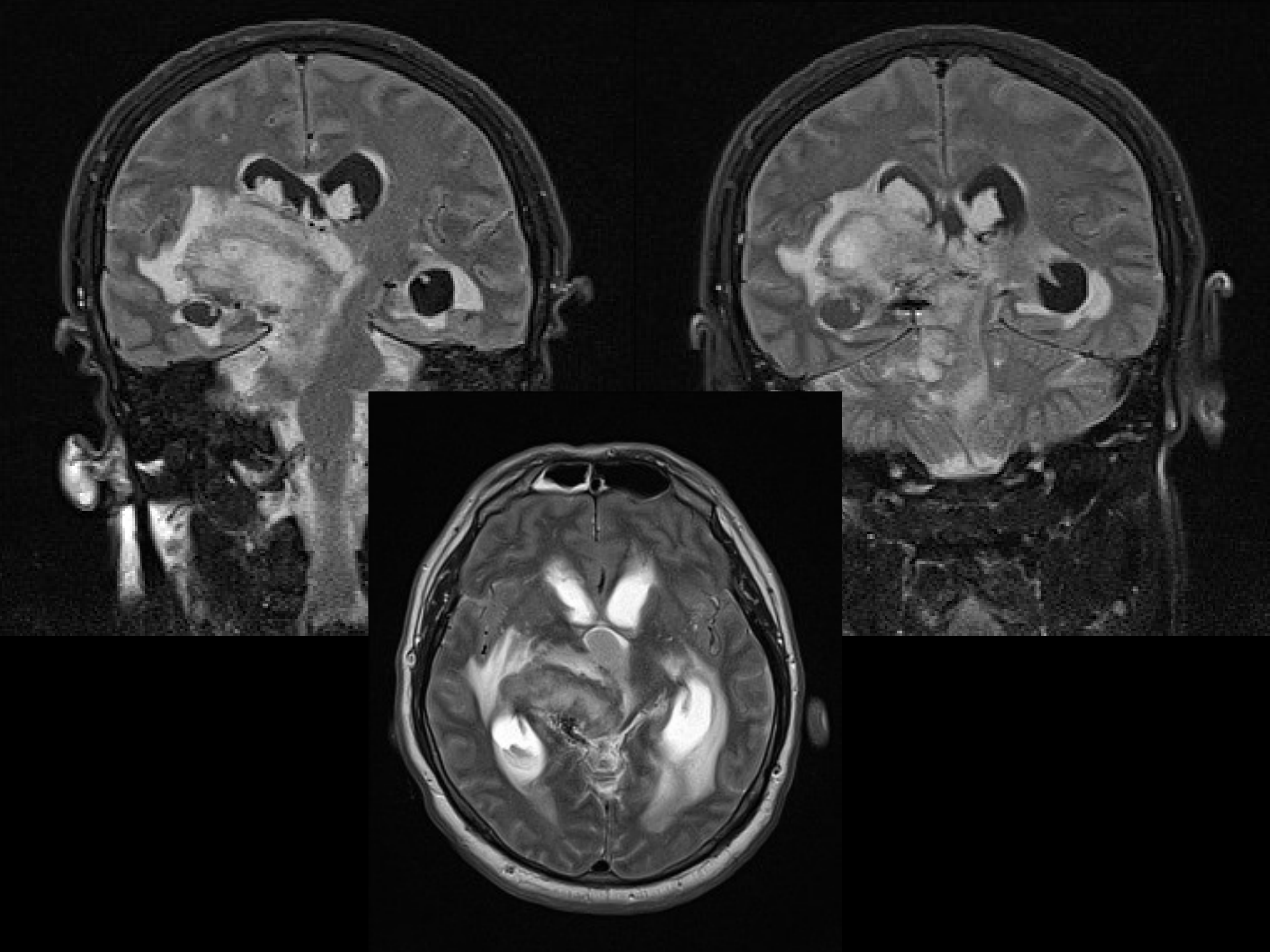


coil

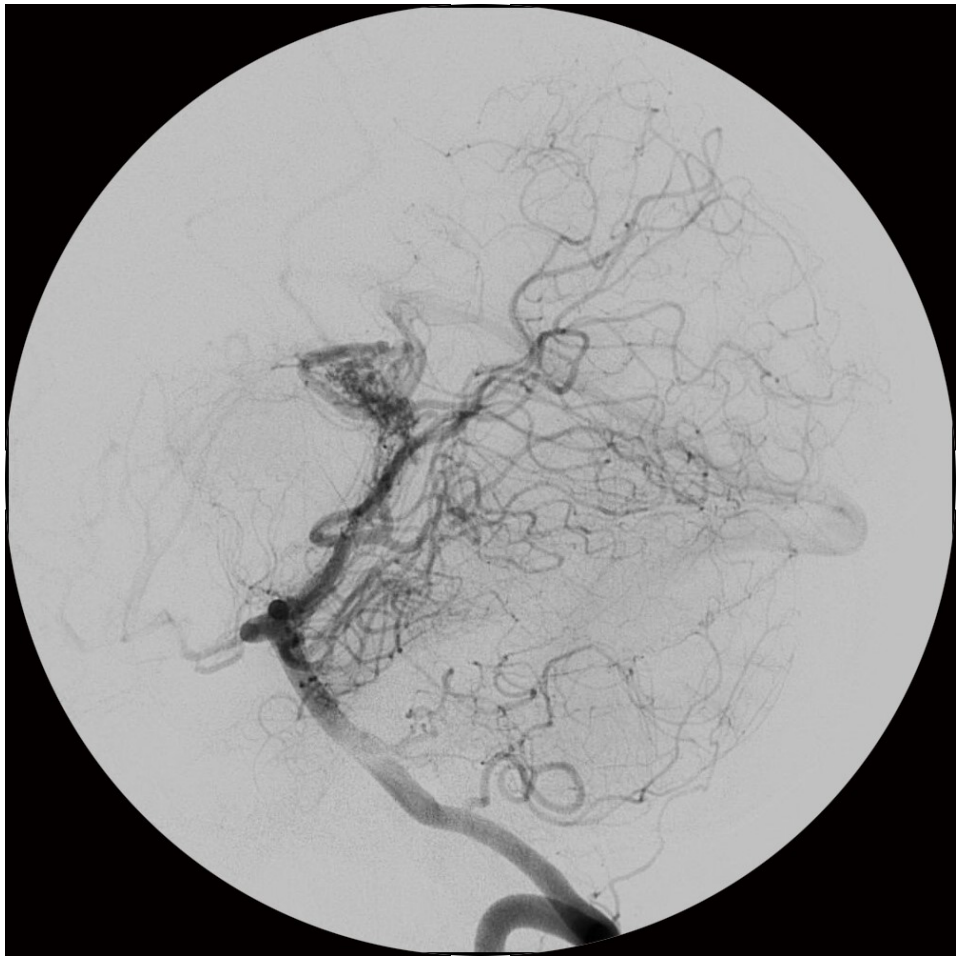


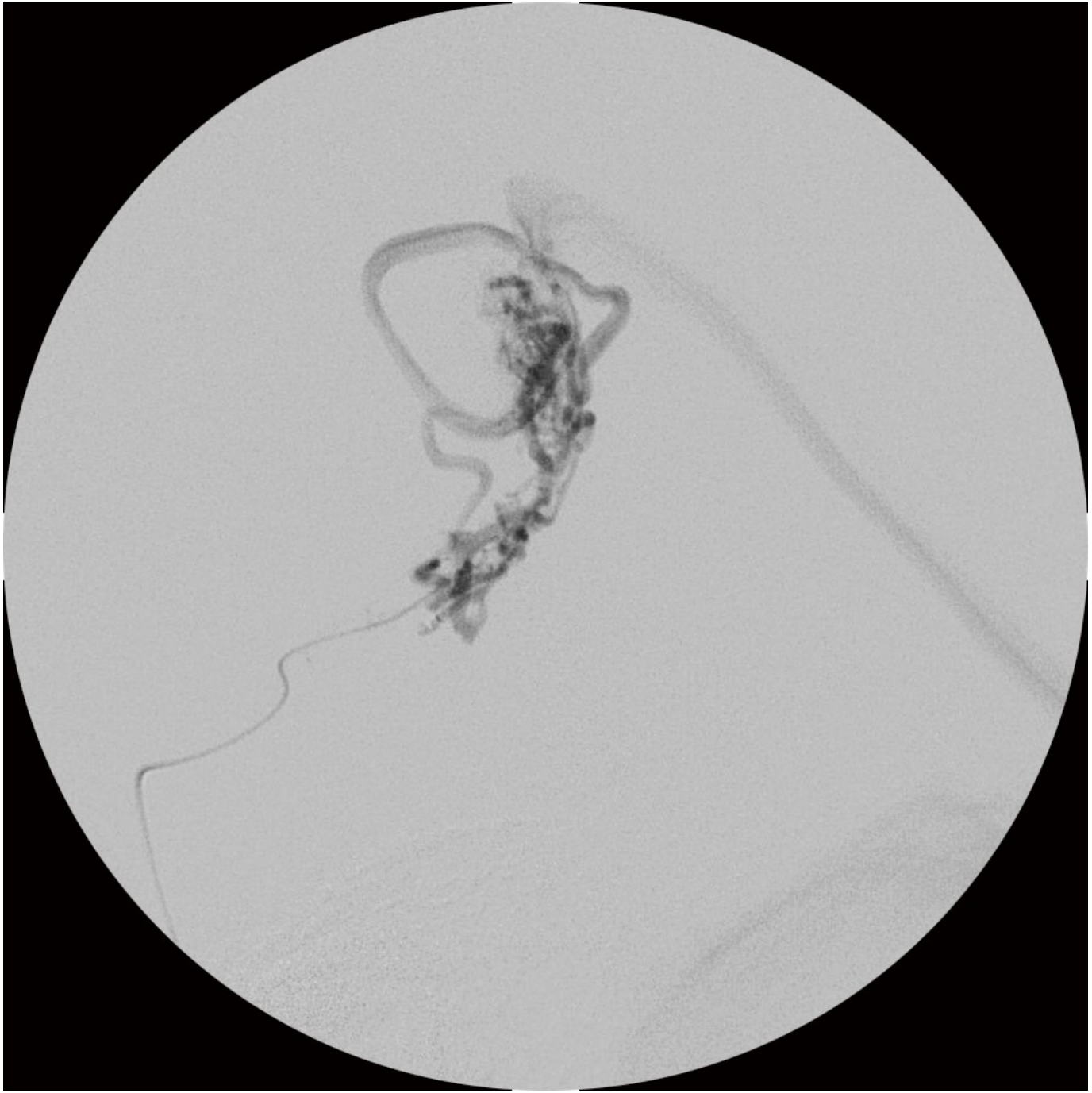
AV Malformation

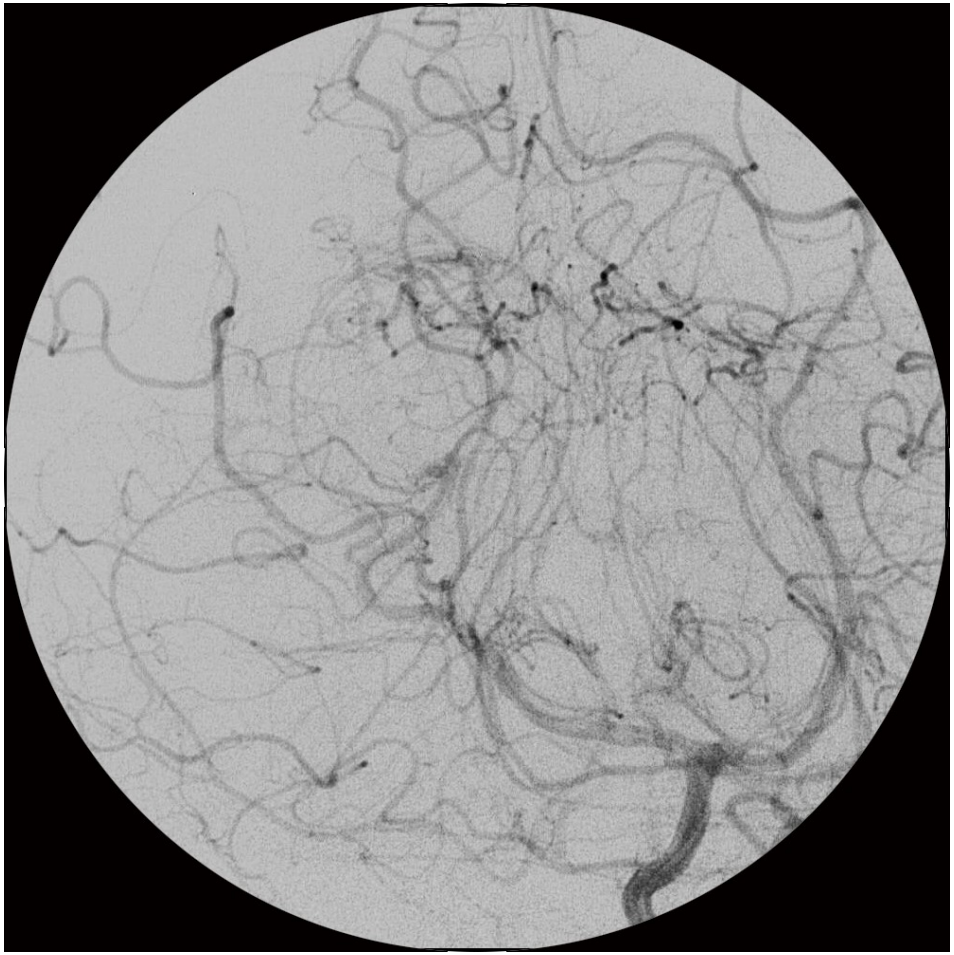


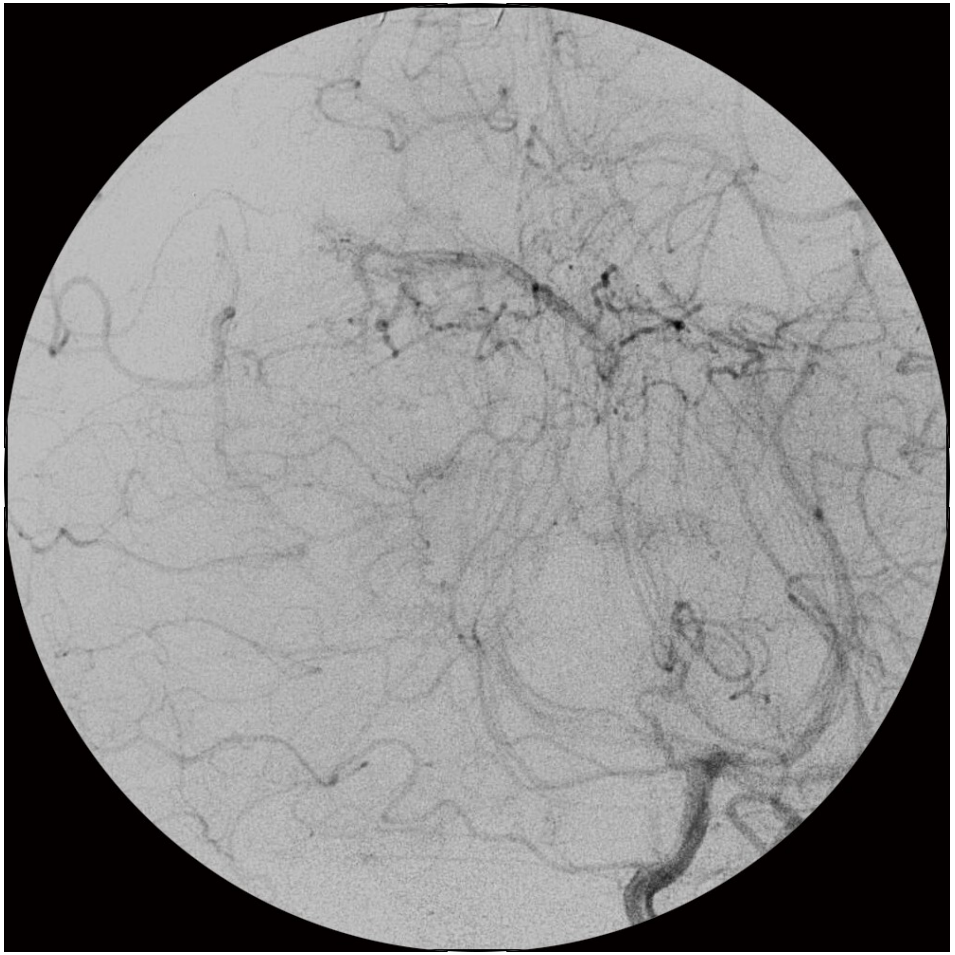


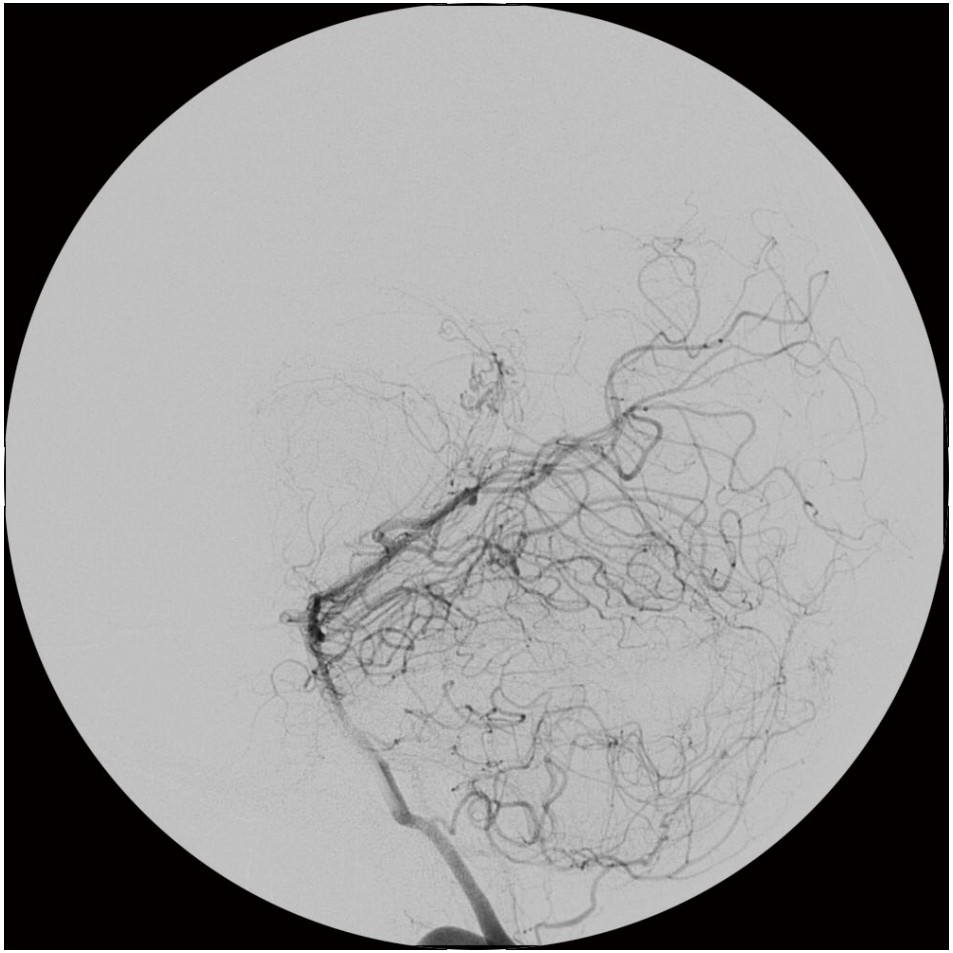
22y

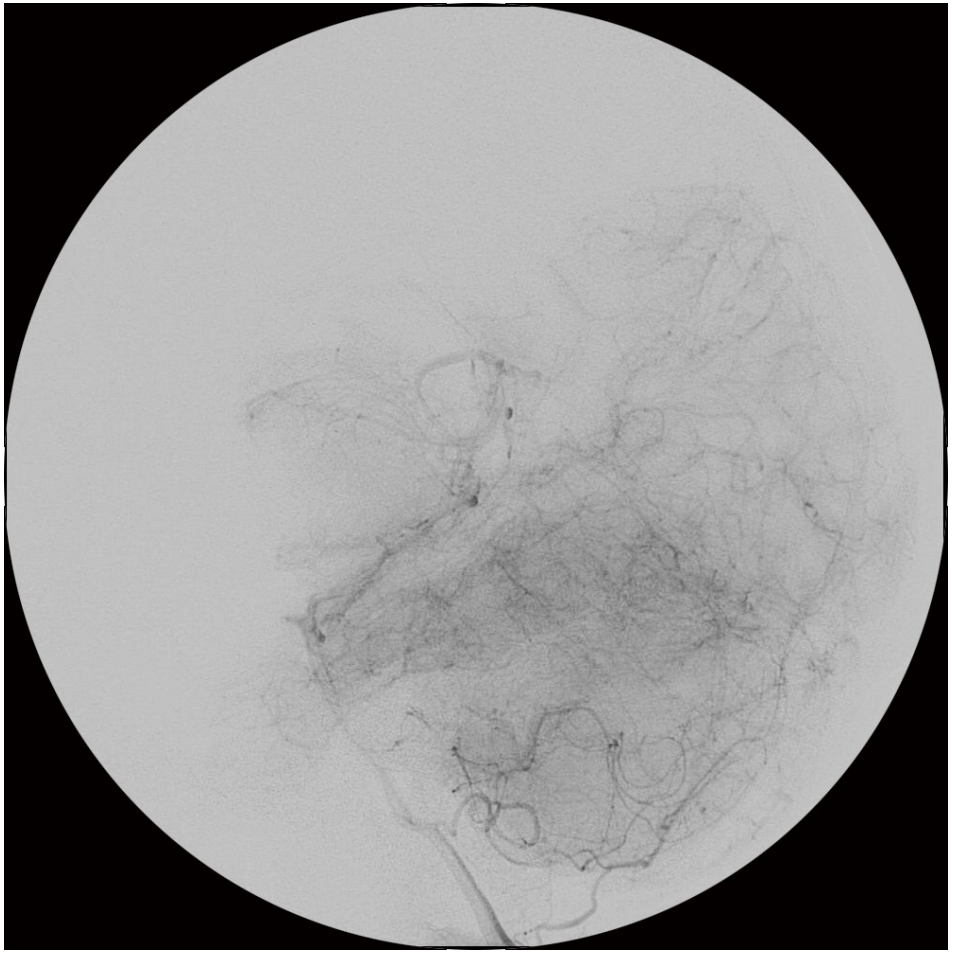




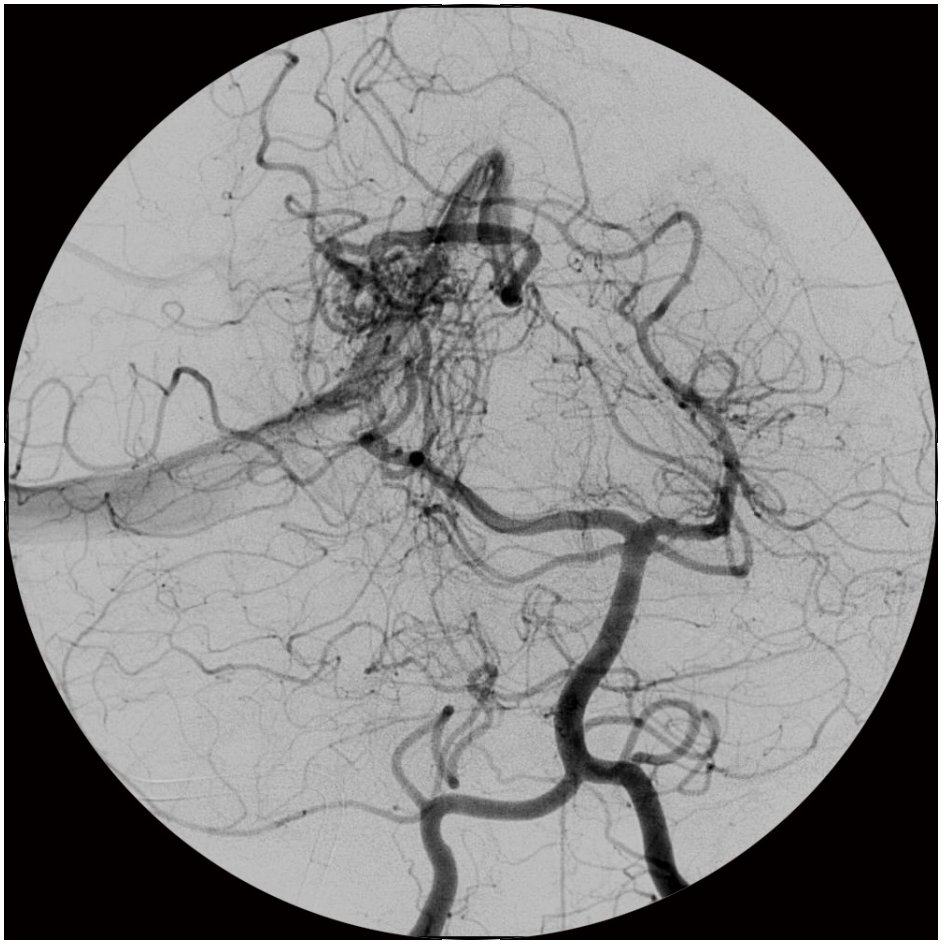


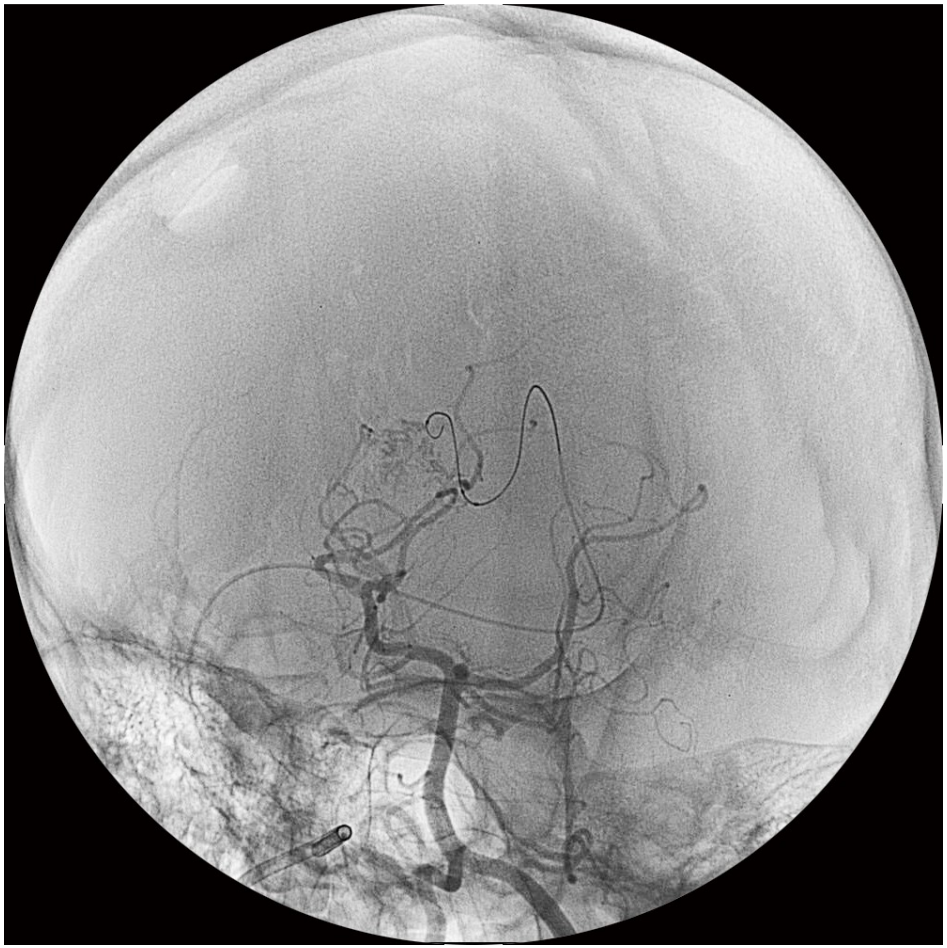


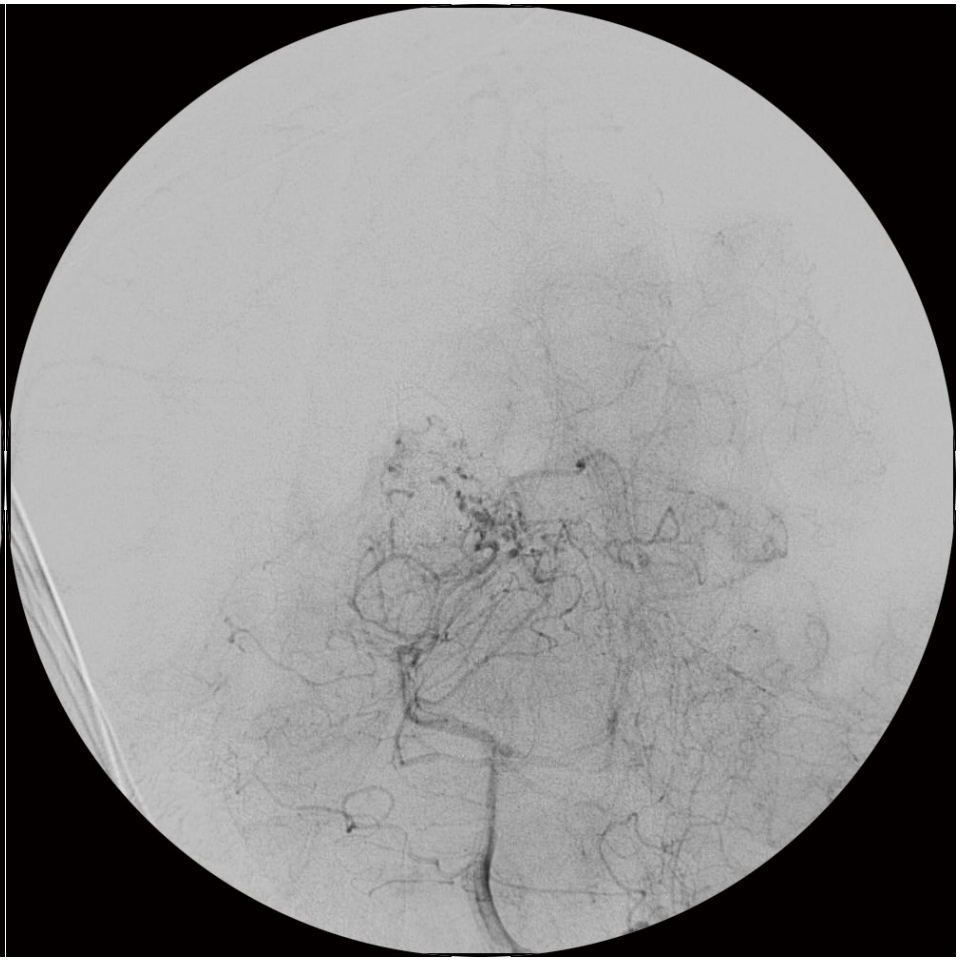


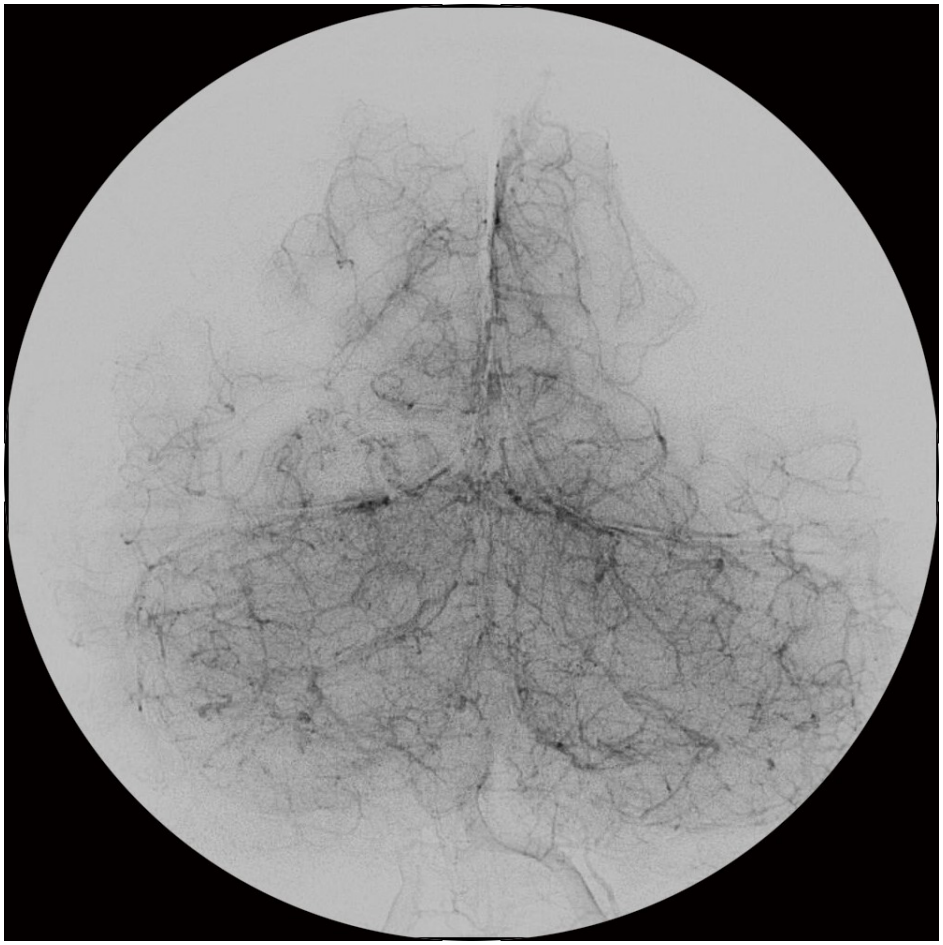


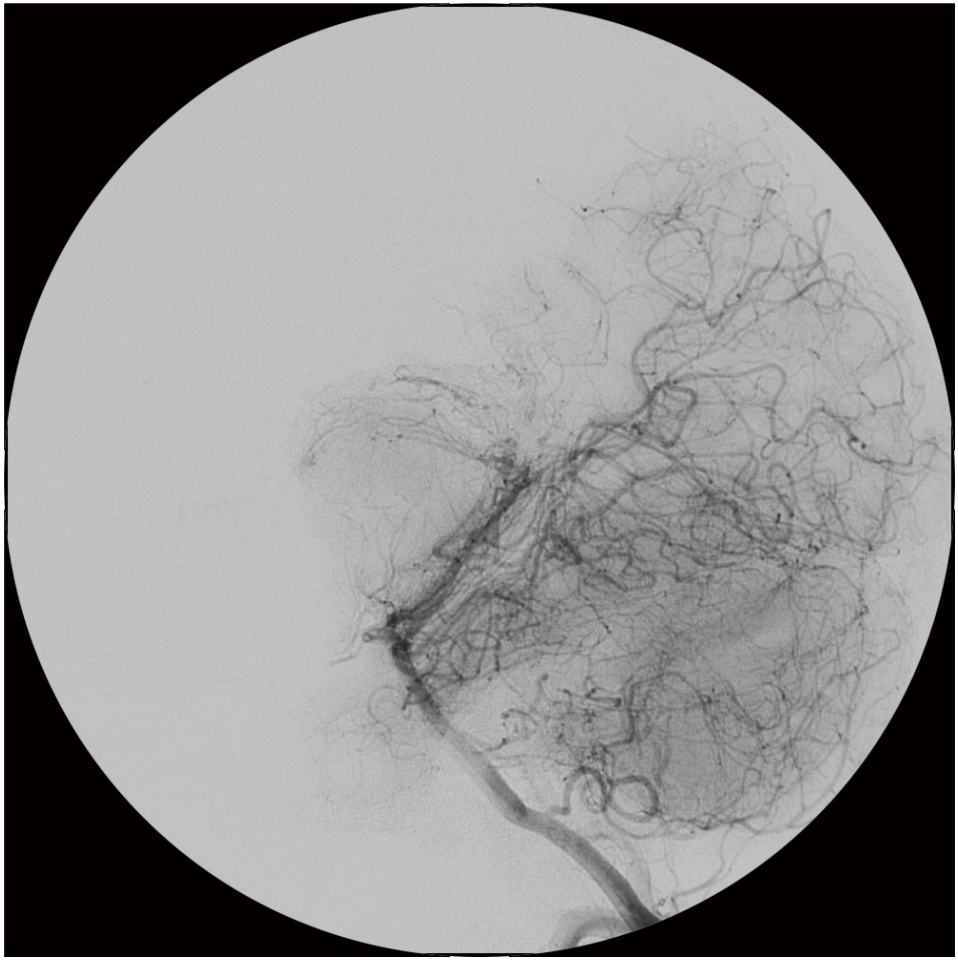
1 month







What is new?

1. „ HELP ” new polyurethane-based liquid polimer
2. combined arterio - venous approach - (CAVA)
3. intraoperativ arterio - venous pressure (Δ P) monitoring
4. post-interventional controlled hypotension

Approach of the intervention

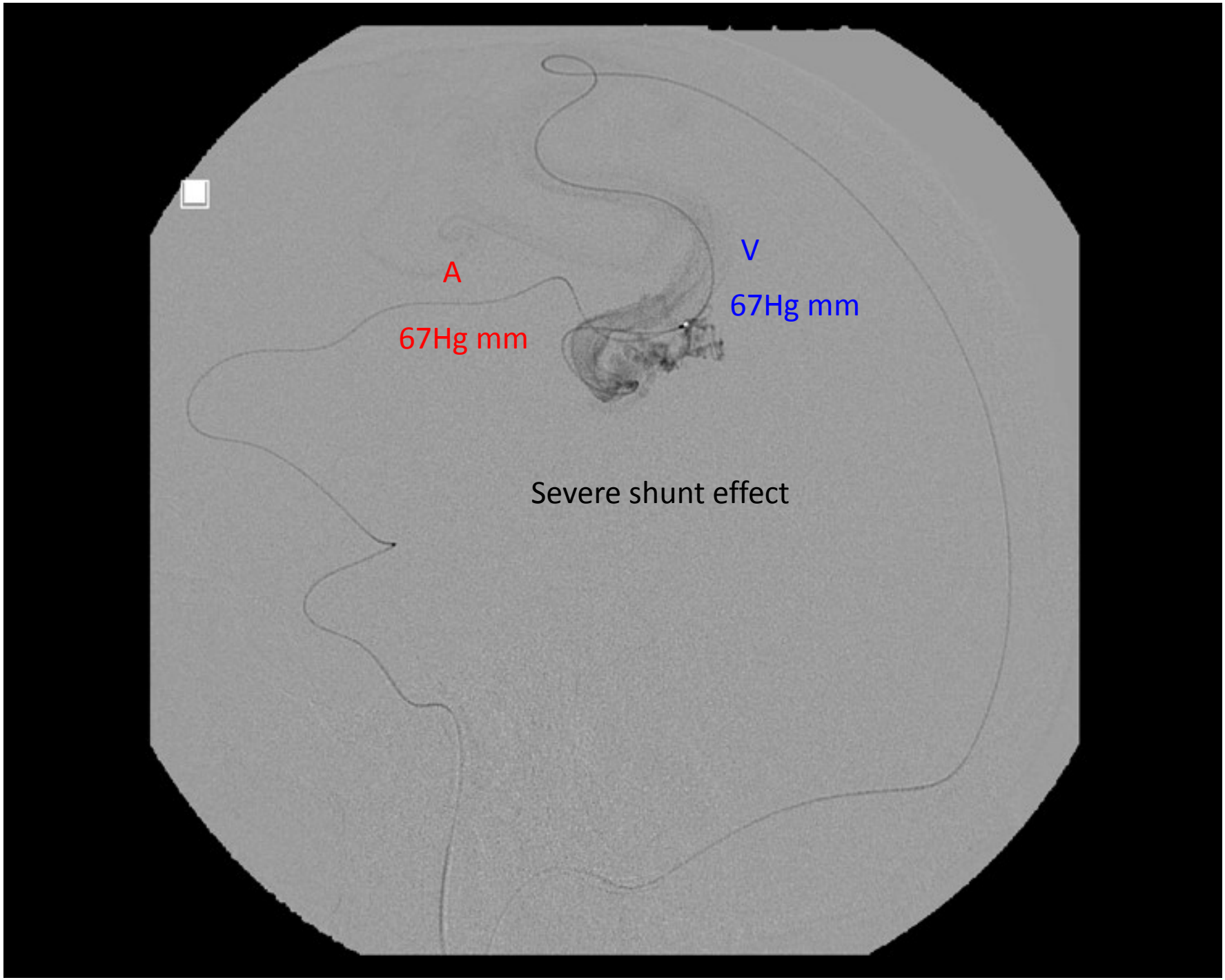
- Transarterial
- Transvenous through the arterial route
- Transarterial-transvenous (two catheters)
- Transvenous

Transartériás embolizáció nehézségei

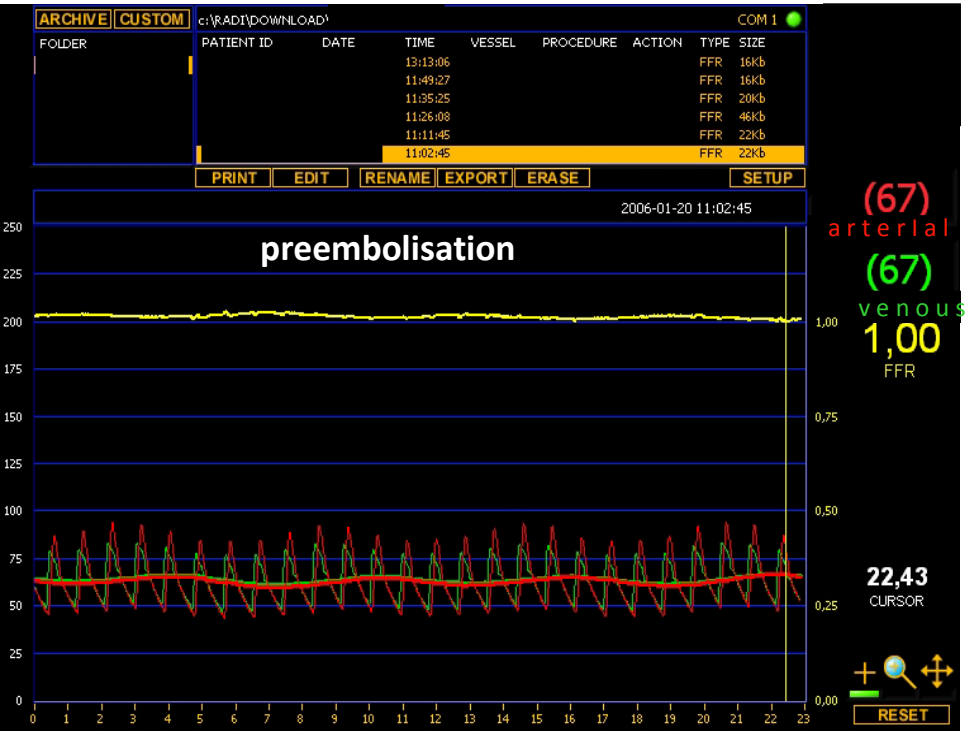
- sok nem katéterezhető tápláló ér
- Angiográfiásan nem látható arteriolák
- AVM eloquens területi előfordulása
- AVM nidus több független szektorból állhat

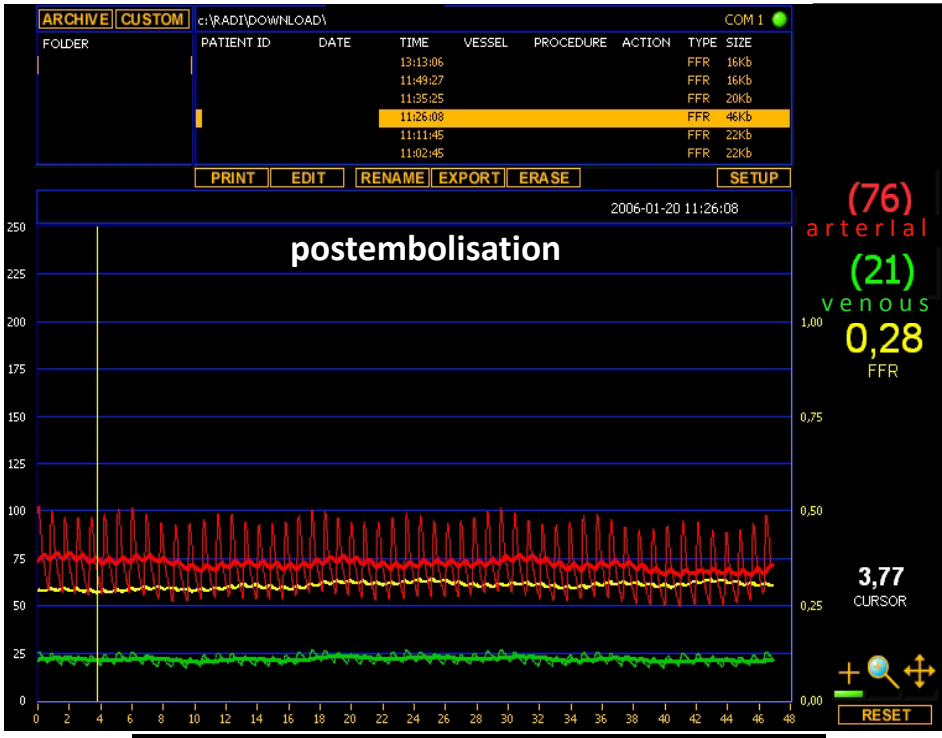
Combined approach (CAVA)

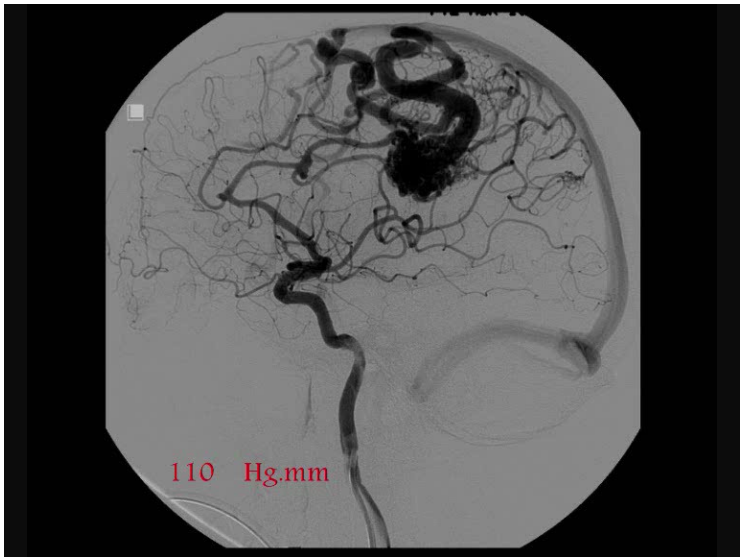
- Több AVM, mely transzarteriálisan nem volt operálható, a kombinált eljárással
- Ischémiás szövődmények csökkenthetők
- A teljes AVM embolizáció aránya növelhető
- A műtéti szám csökkenthető

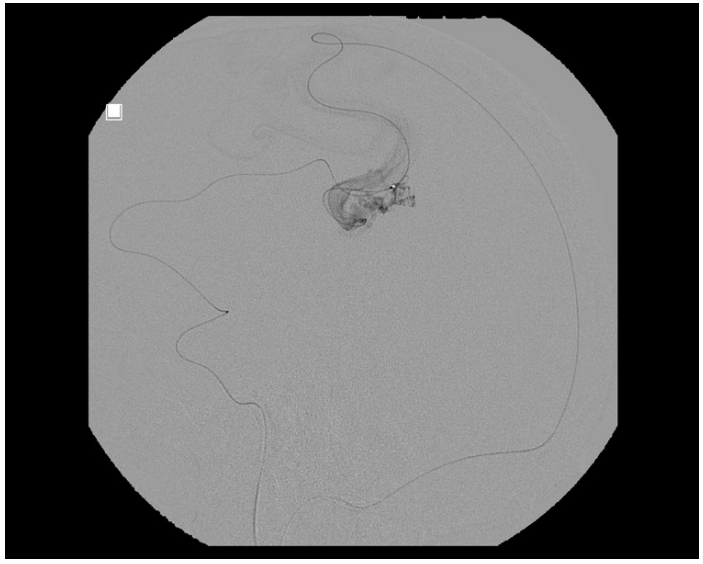

A
67Hg mm
V
67Hg mm
Severe shunt effect

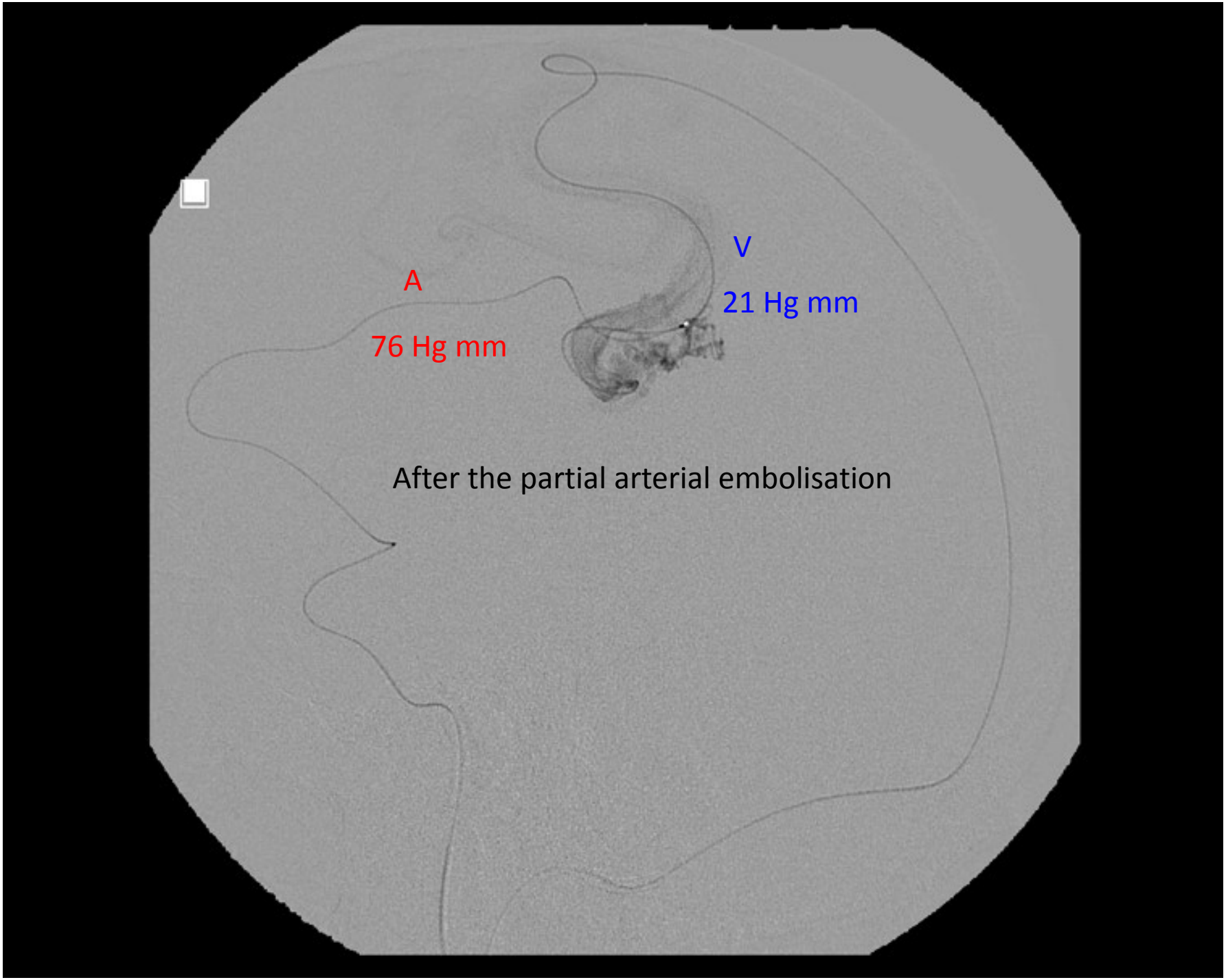
After partial transarterial embolisation nidal pressure gradient dropped to one third







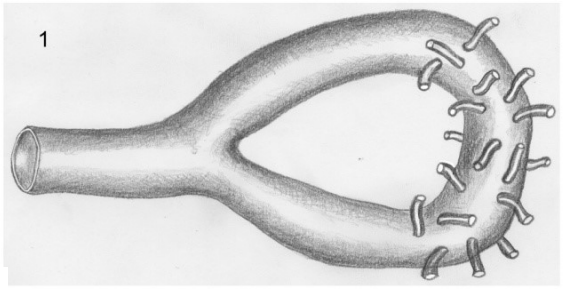


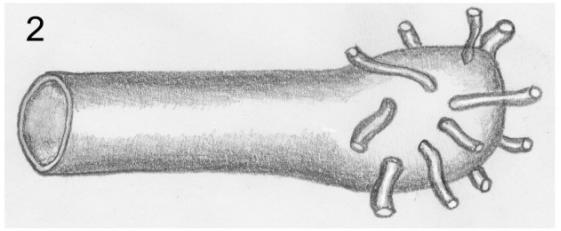

V
21 Hg mm
A
76 Hg mm
After the partial arterial embolisation

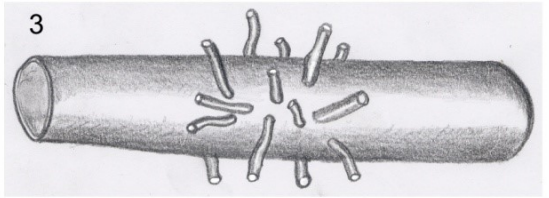
Types of AVM-venous drainage:

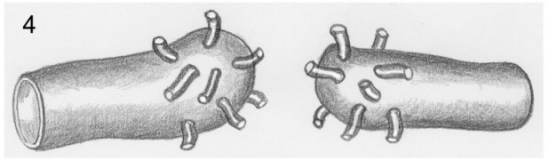
Technique of occlusion is dependent on these types:

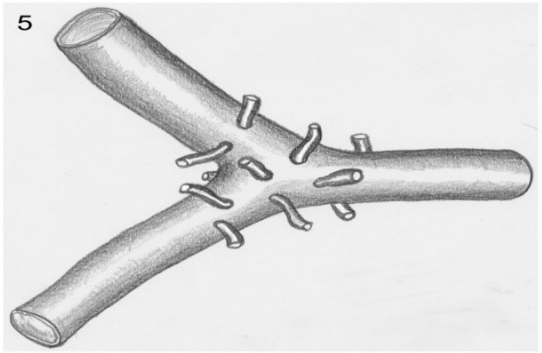
The analysis of venous structure is extremely important before embolisation!







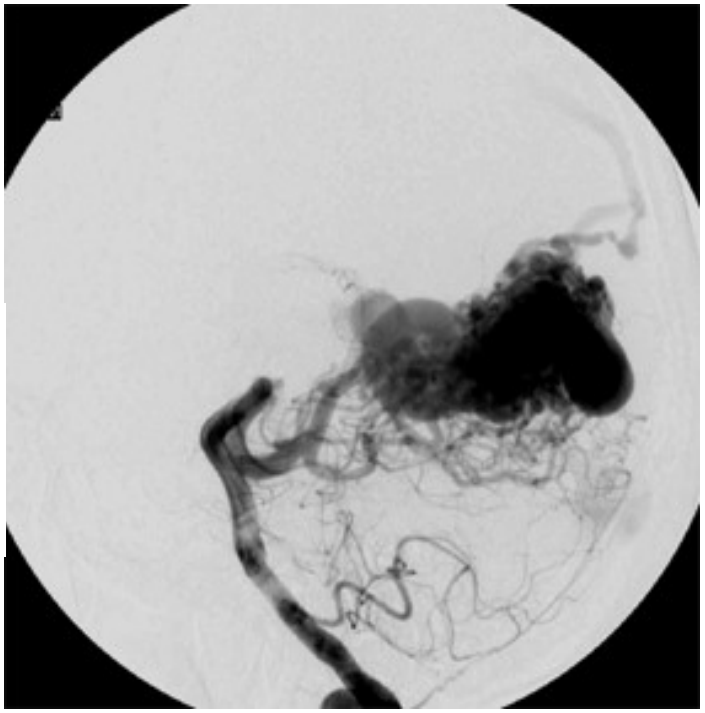


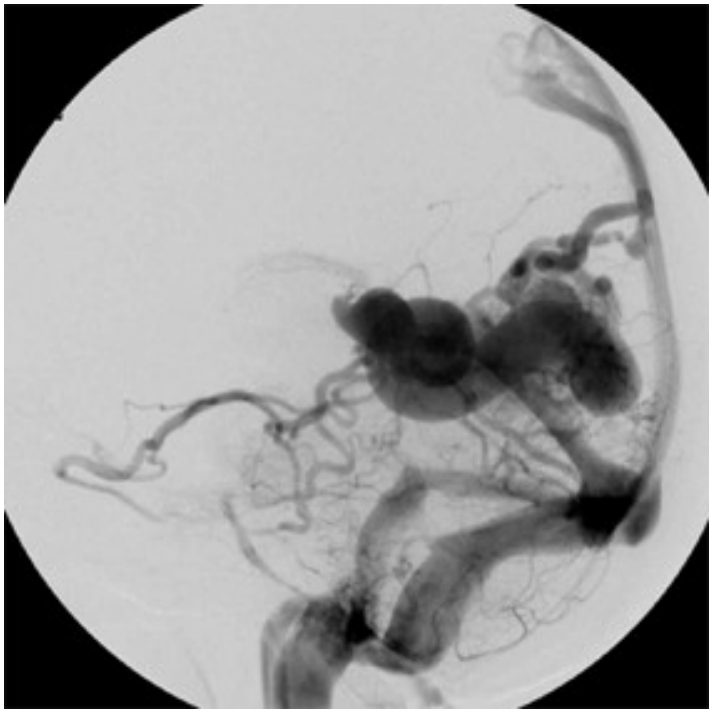


Fistulous and plexiform AVM

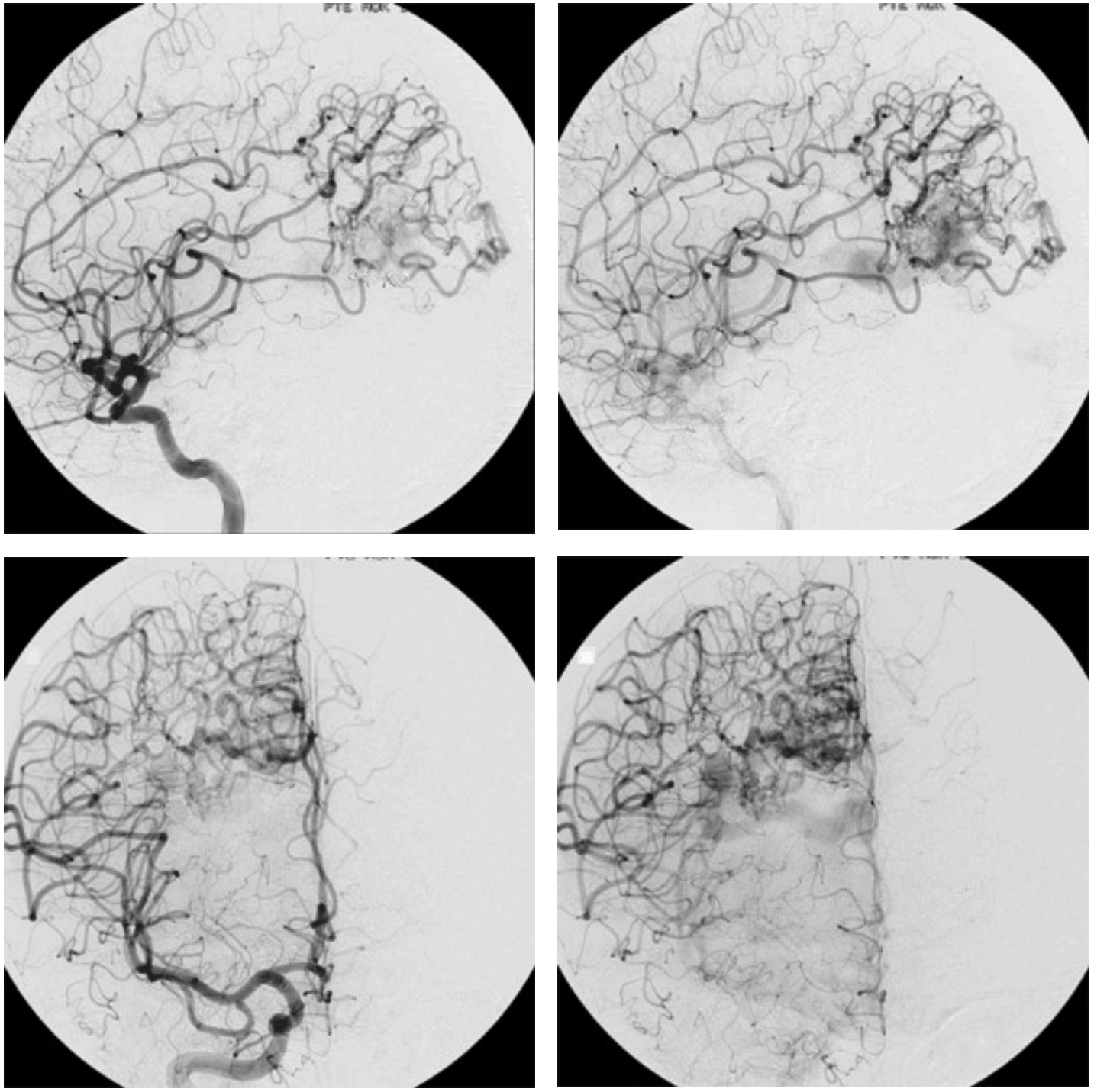
48 y female severe headache for 5 y

vertebral angiography





carotid angiography



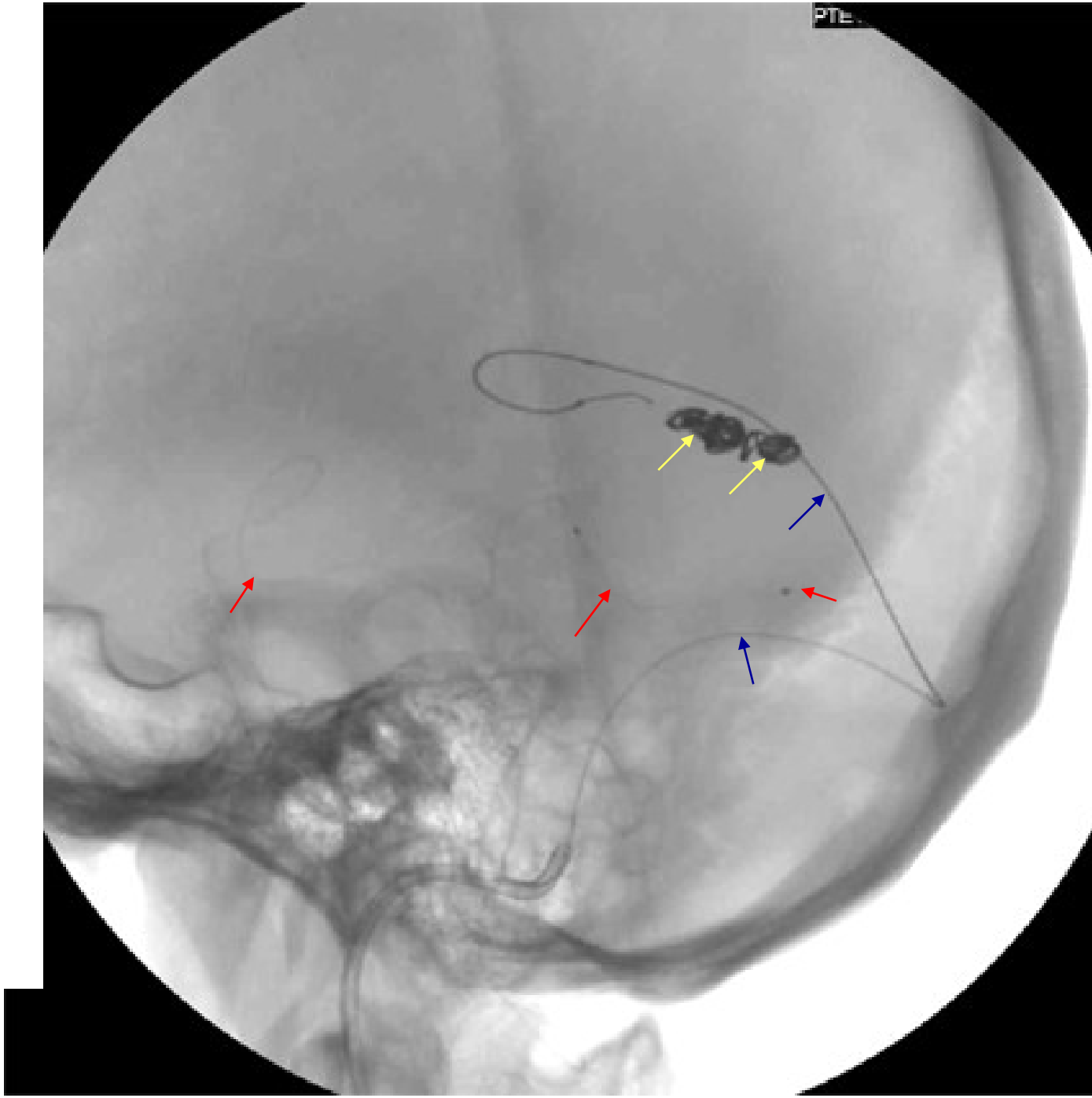
1st step (12.05.2004):
disjunction of fistula by means of GDC and „HELP”:

2nd step (16.06.2004):
transvenous catheterisation of draining vein:

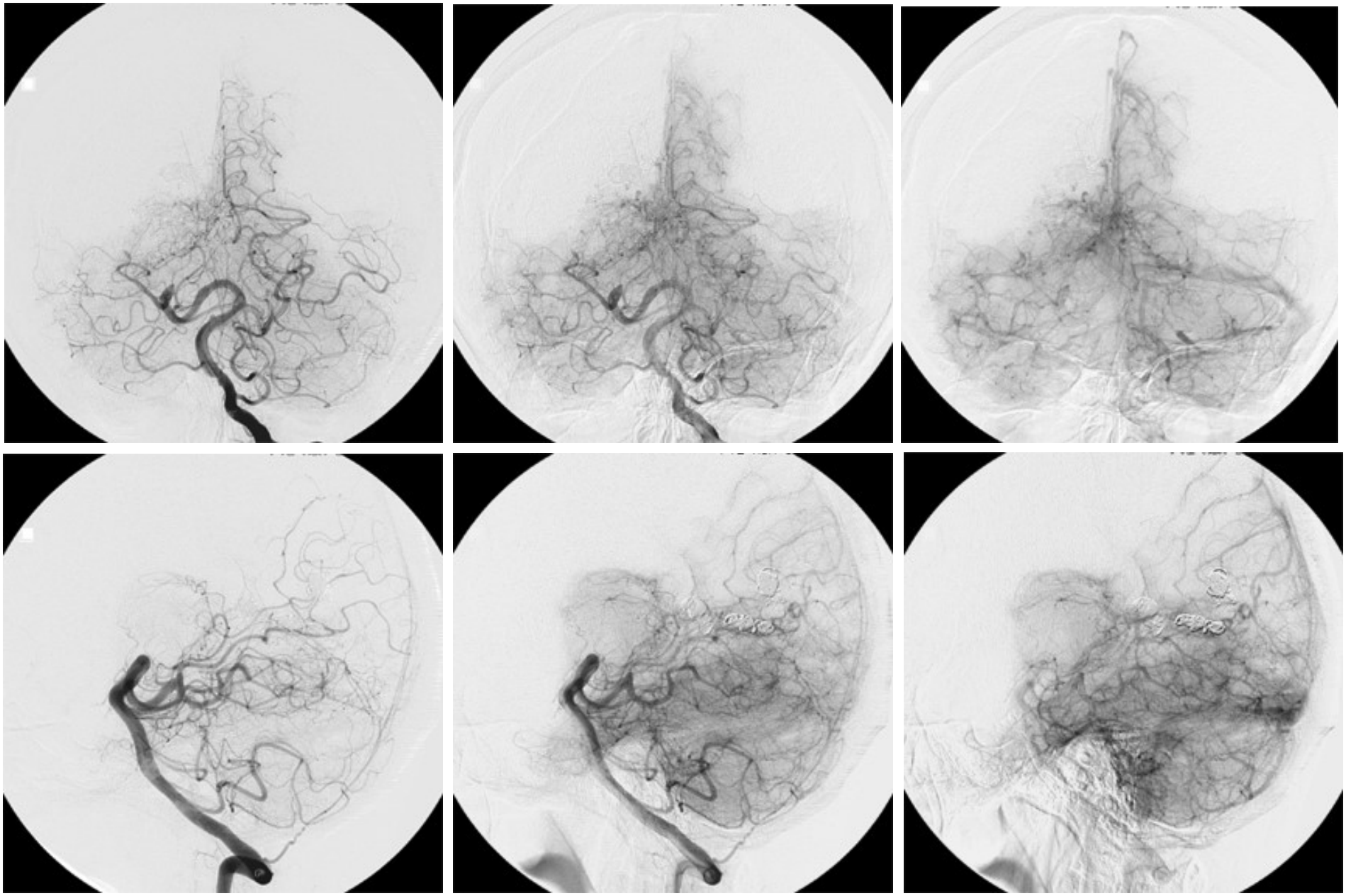
3rd step (16.06.2004):
transarterial catheterisation of the PCA feeder

4th step (16.06.2004):
transarterial embolisation of AVM nidus by means of „HELP”

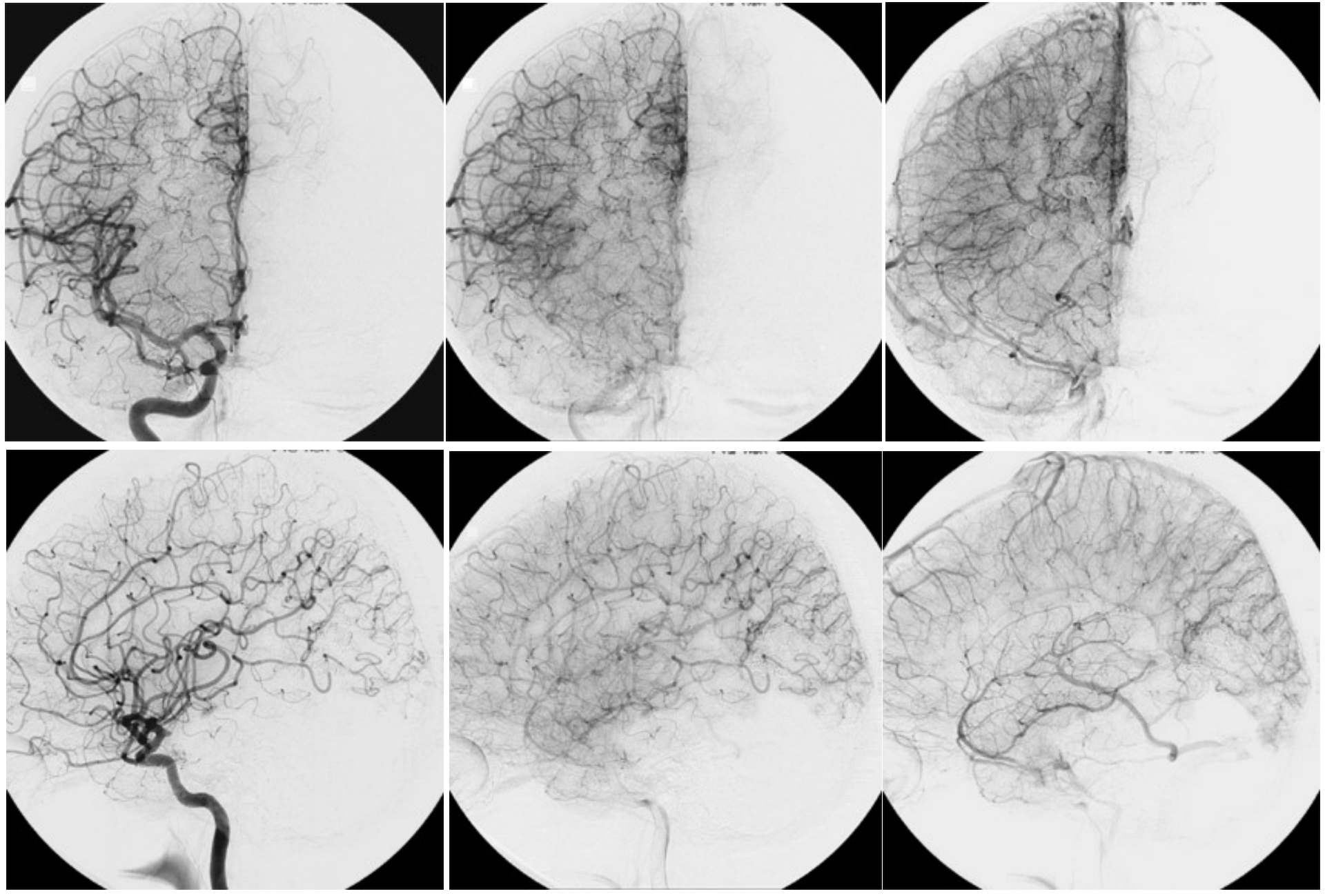
5th step (16.06.2004):
trans-venous occlusion of the draining vein of AVM by means of GDC and „HELP”



Vertebral angiography (20.06.2004) 4 day after the 5th (last) step (16.06.2004)

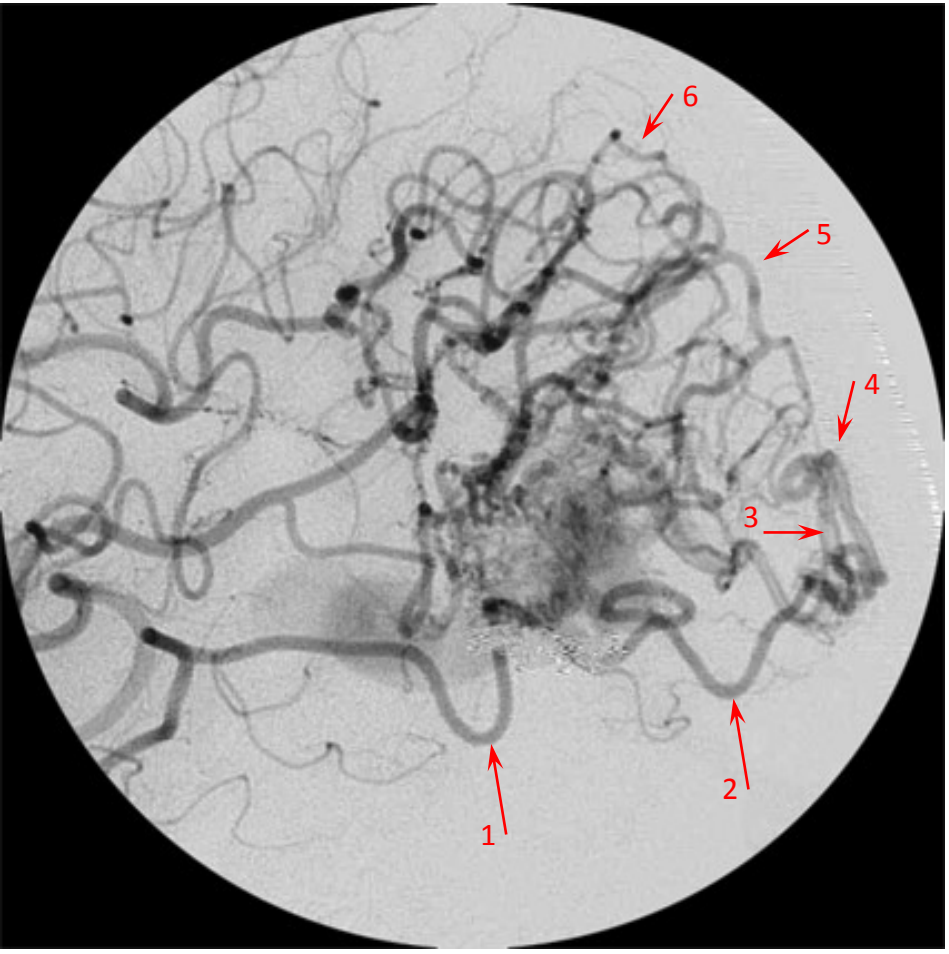


Carotid angiography (20.06.2004) 4 day after the 5th (last) step (16.06.2004)



Preop. carotid angiography

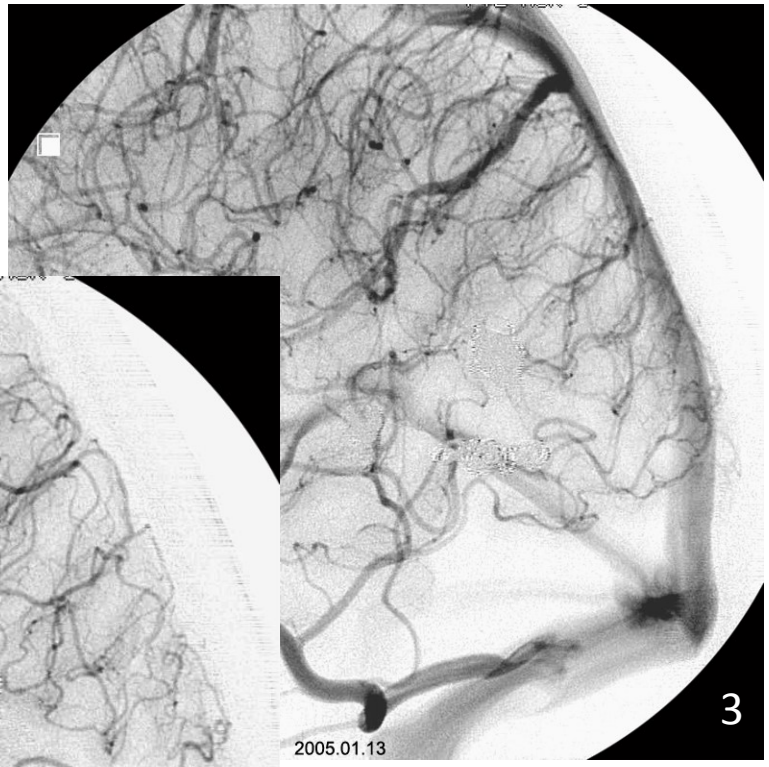
Carotid angiography
4 months after the 5th (last) step

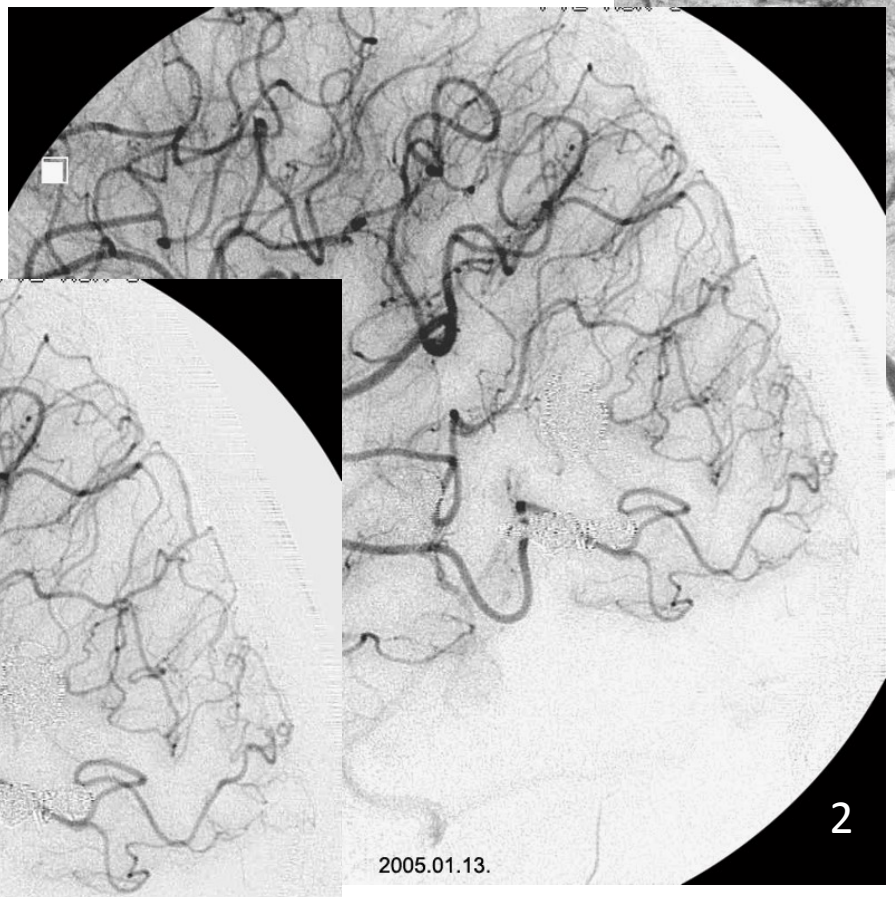


Normalisation of „pathological" vessels / normalisation of „autoregulation"?

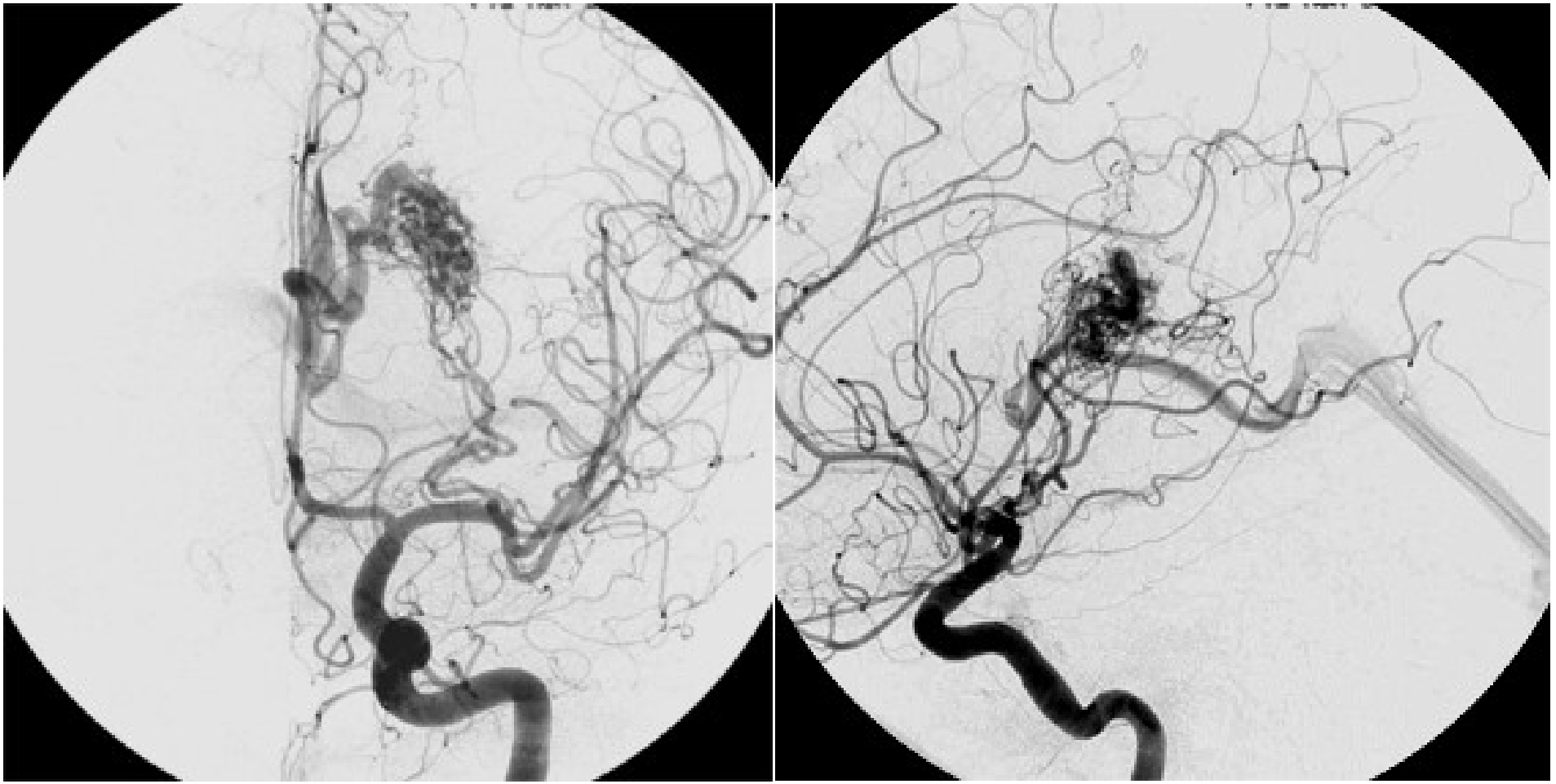
without any embolisation of the feeders !!!

Carotid angiography
4 months after the 5th (last) step

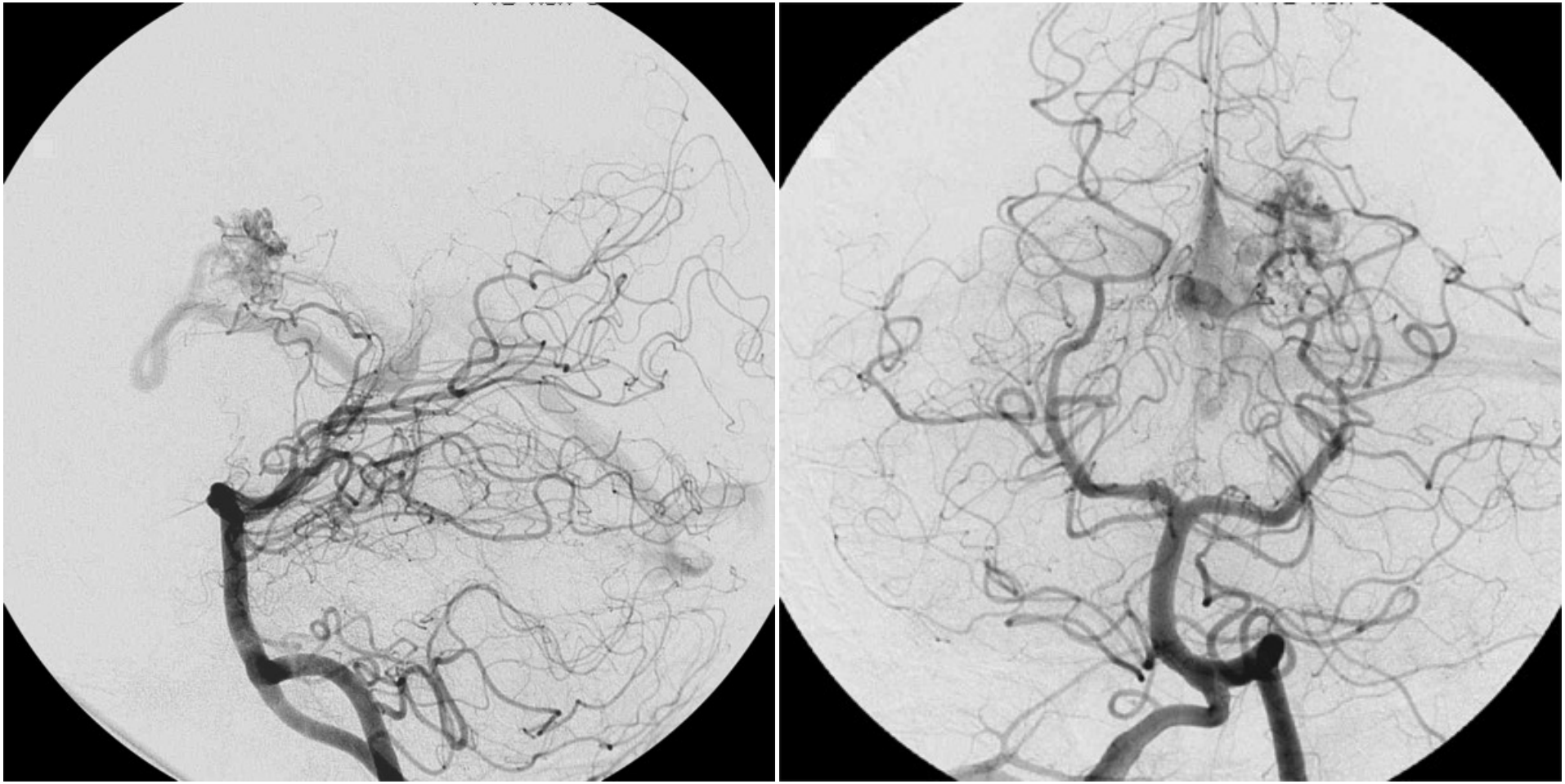




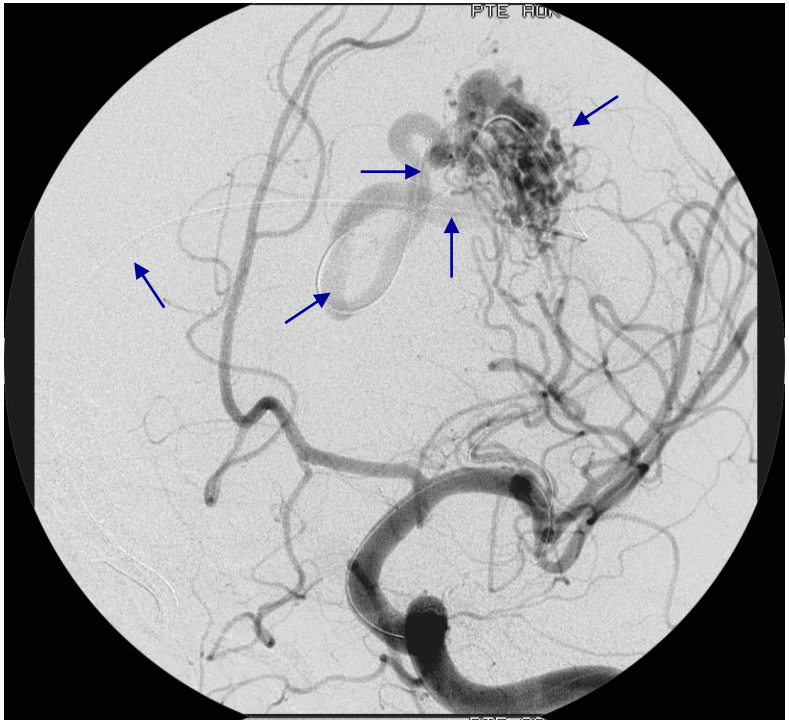
15 y boy, GCS 7, intraventicular and intracerebral haemorrhage, for 14 days ventillated and on ventricular drainage.

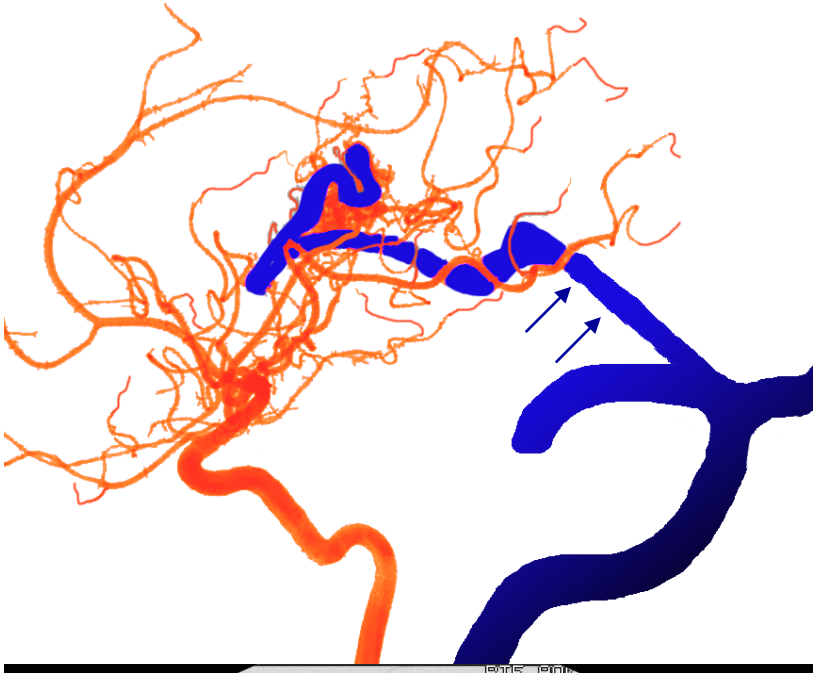


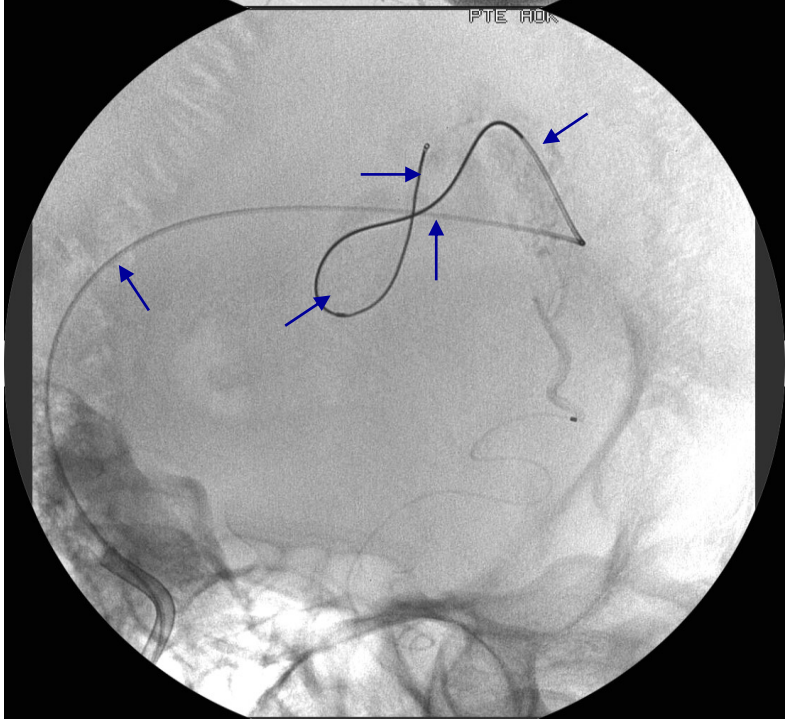
Feeders from: ant.choroidal; lenticulostriates (3)

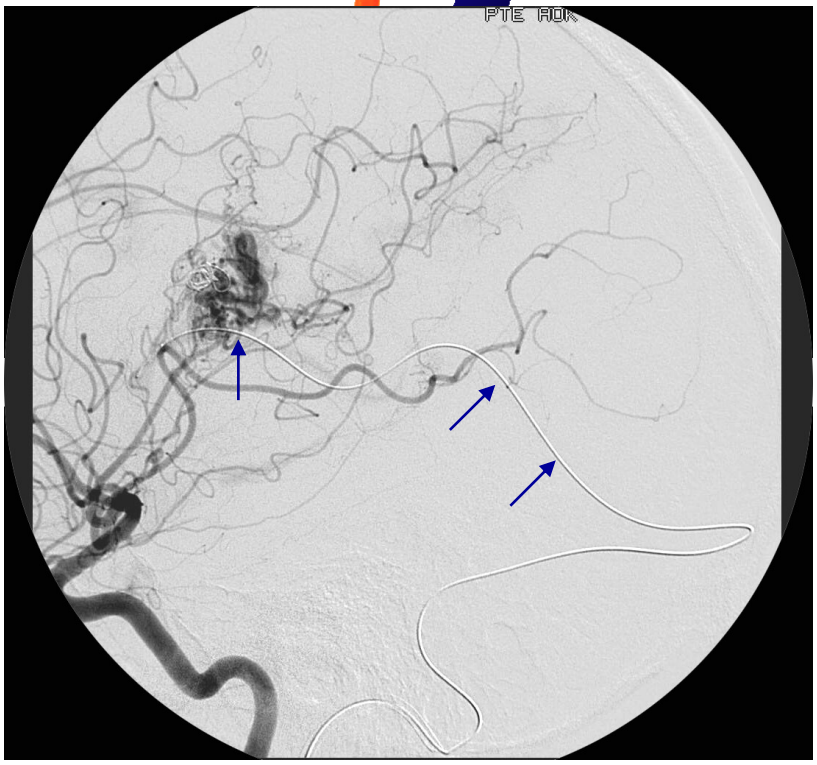


Feeders from: post. choroidal lateral and medial arteries

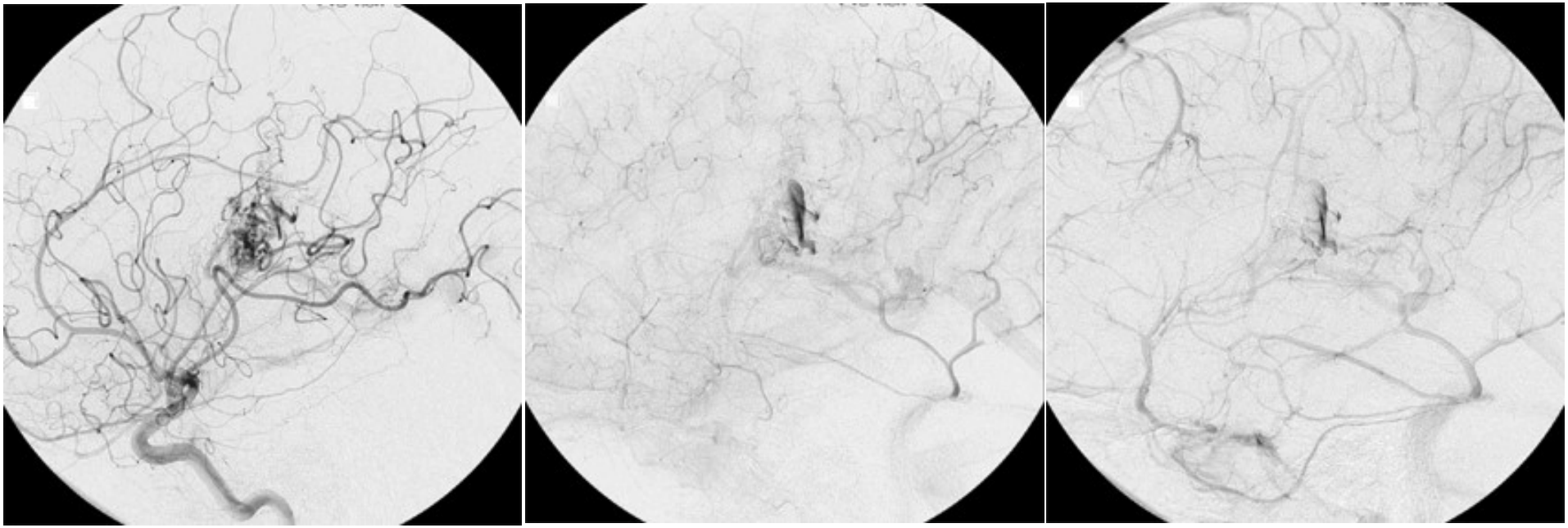

PTE AOK



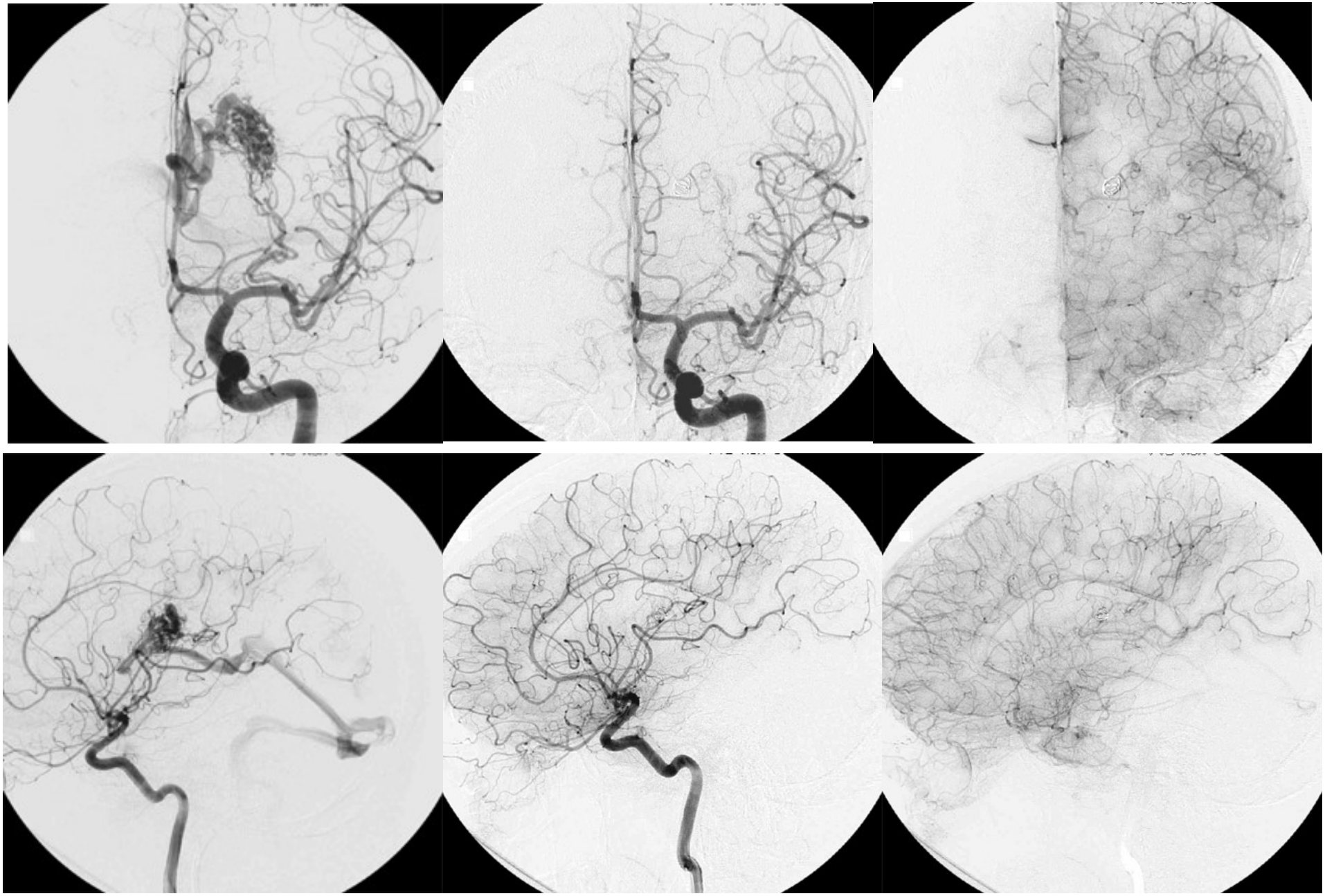

PTE AOK


PTE AOK

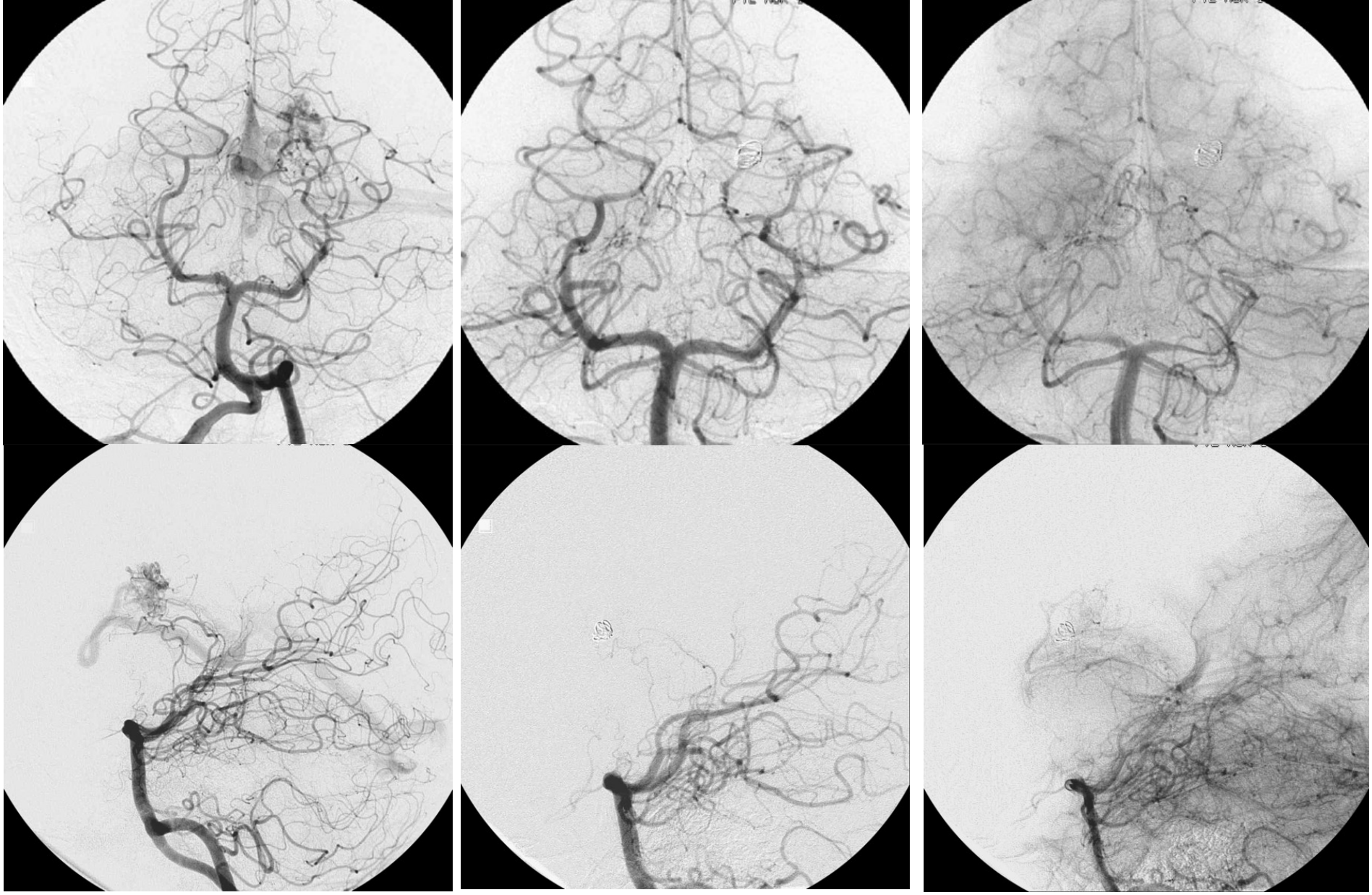
Angiography after embolisation of the nidus via
1 lenticulostriate artery (HELP) and the thalamostriate vein
by means of coils and HELP



Remnants of nidus still filling, and stasis in draining vein

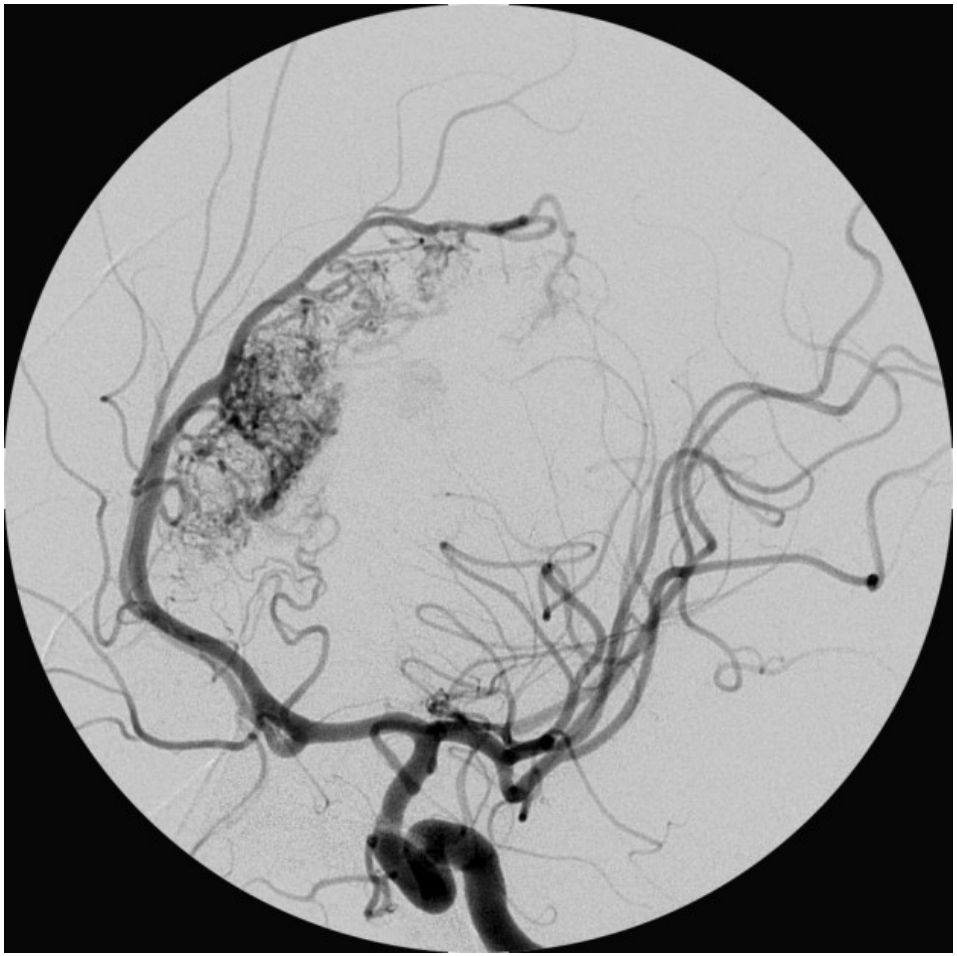


Control angiography 3 months postop.
Only 1 of the feeders embolised!!!!

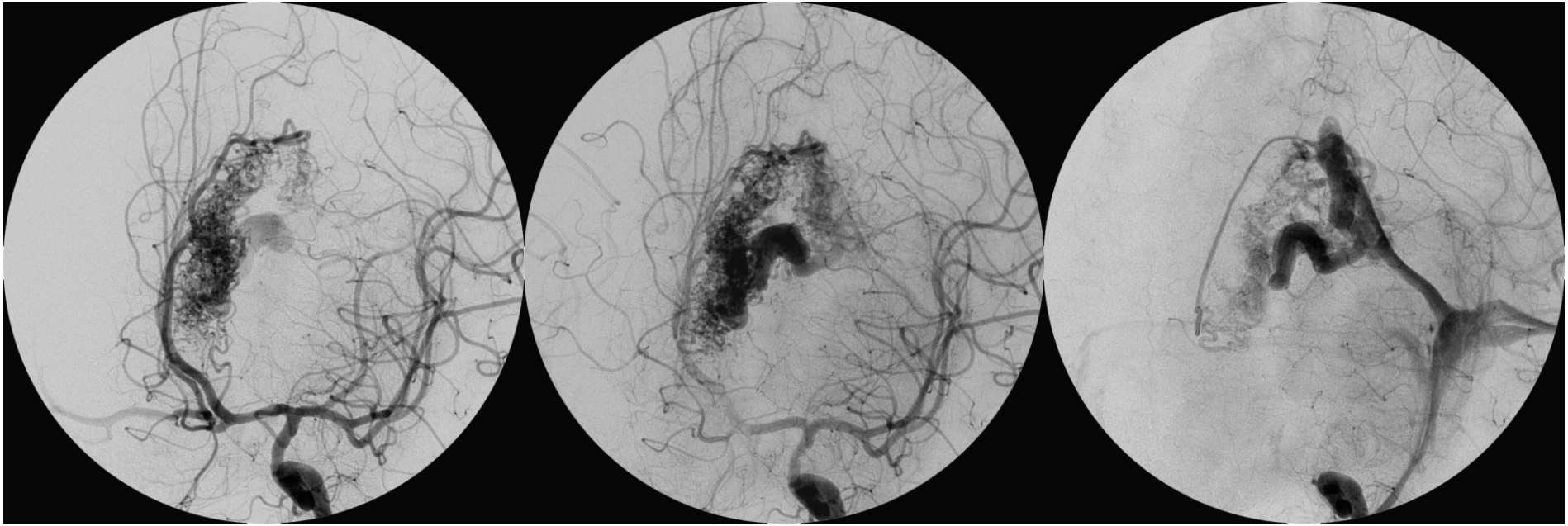


without embolisation of any feeder !!!

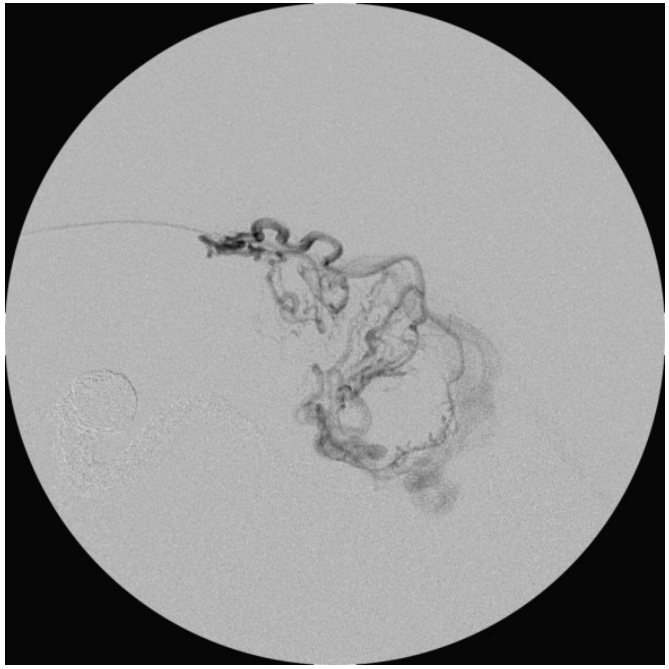
23 y female with SAH

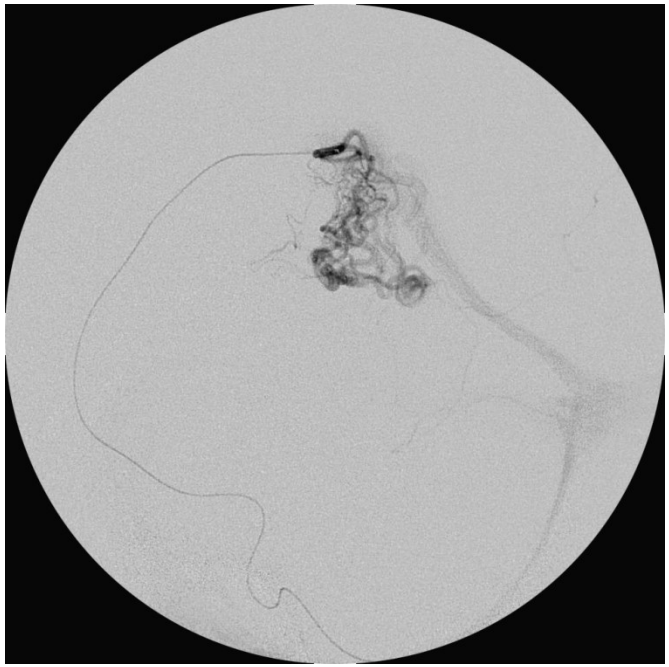


Different phases of contrast filling.

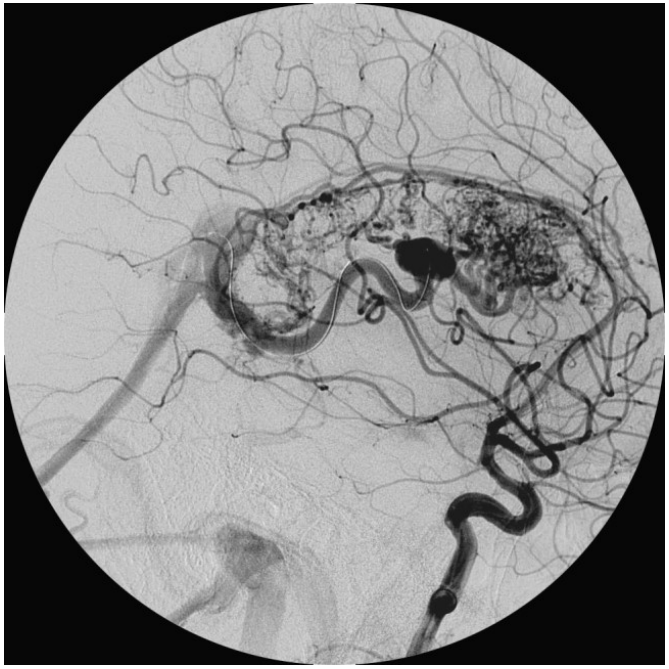


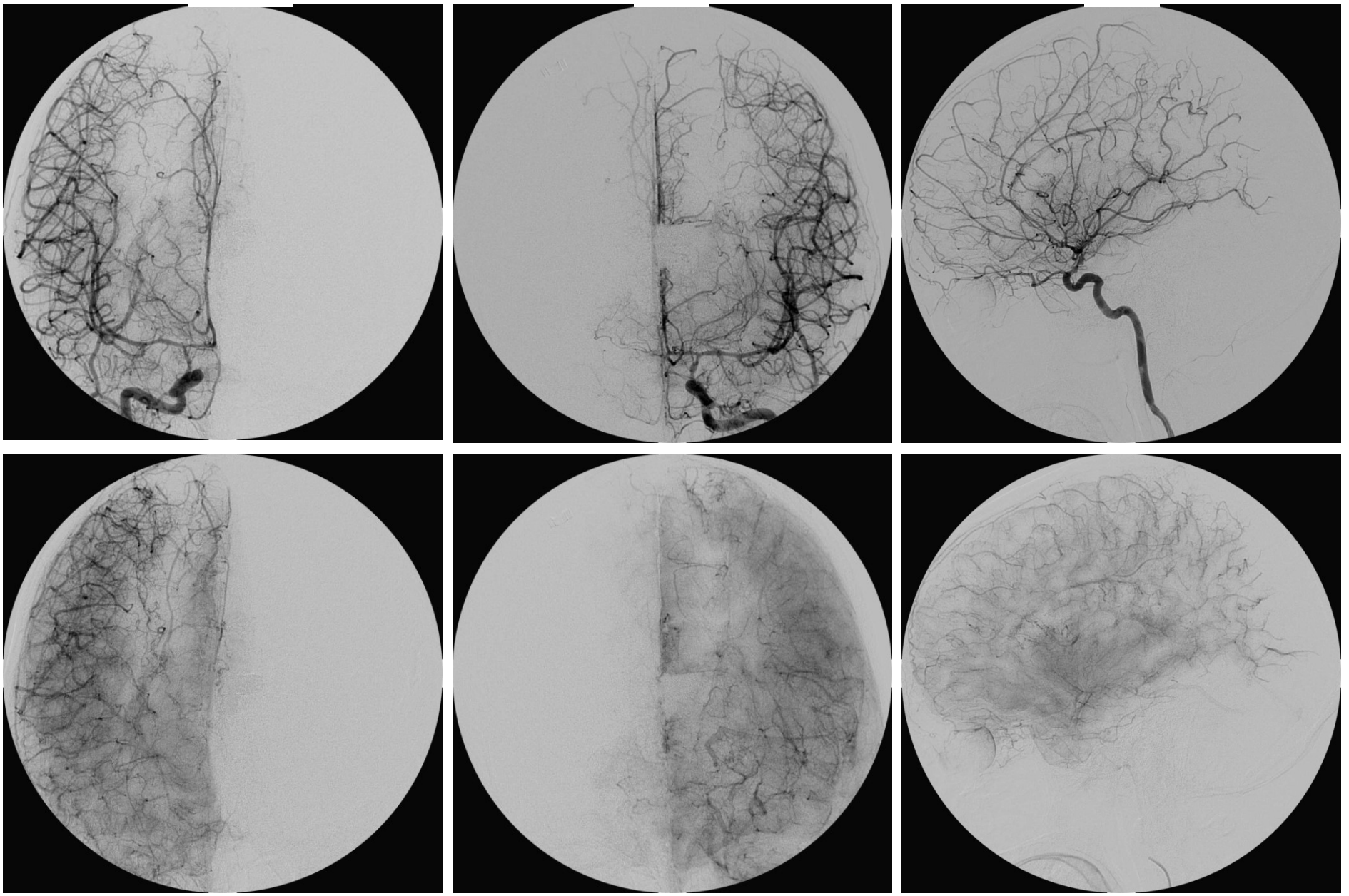
catheterisation of the arterial end

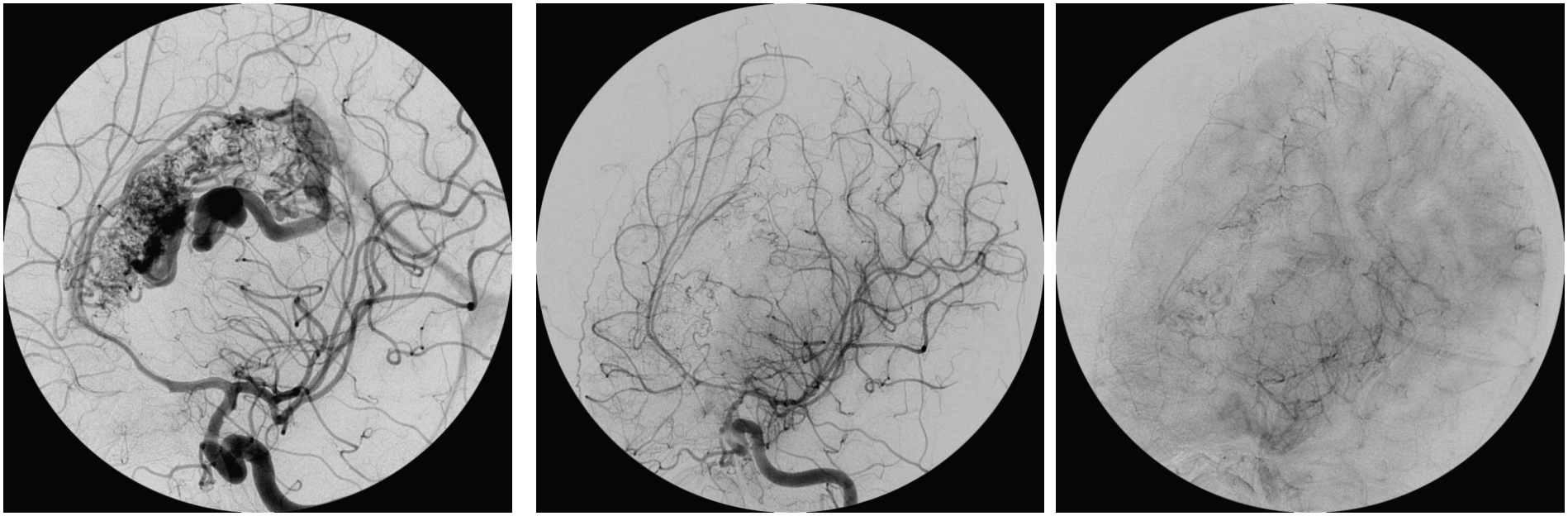




catheterisation of the v. cerebri interna



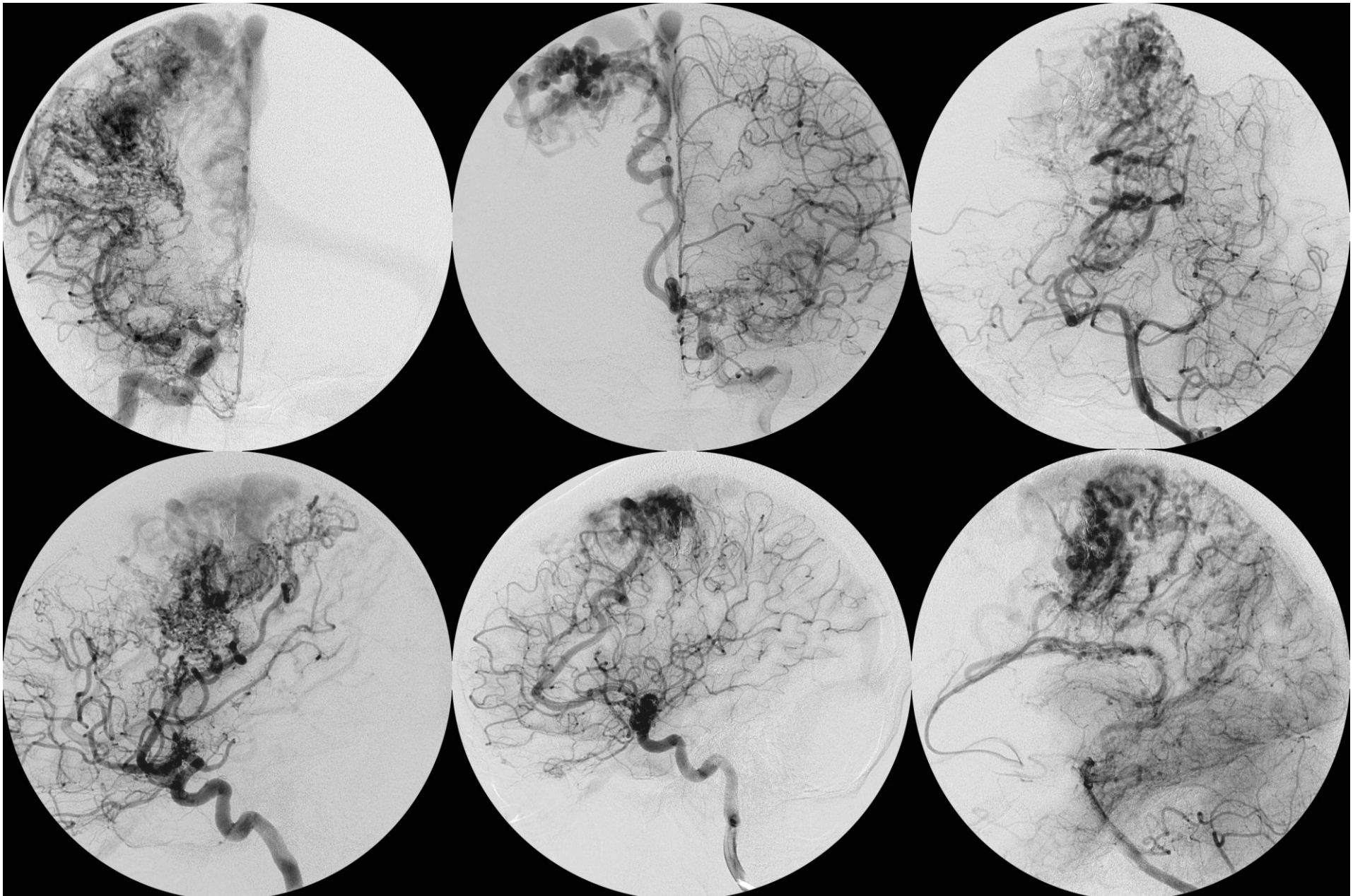

right
left
left



Normalisation of „pathological” vessels / normalisation of „autoregulation”?

without embolisation of all feeders !!!

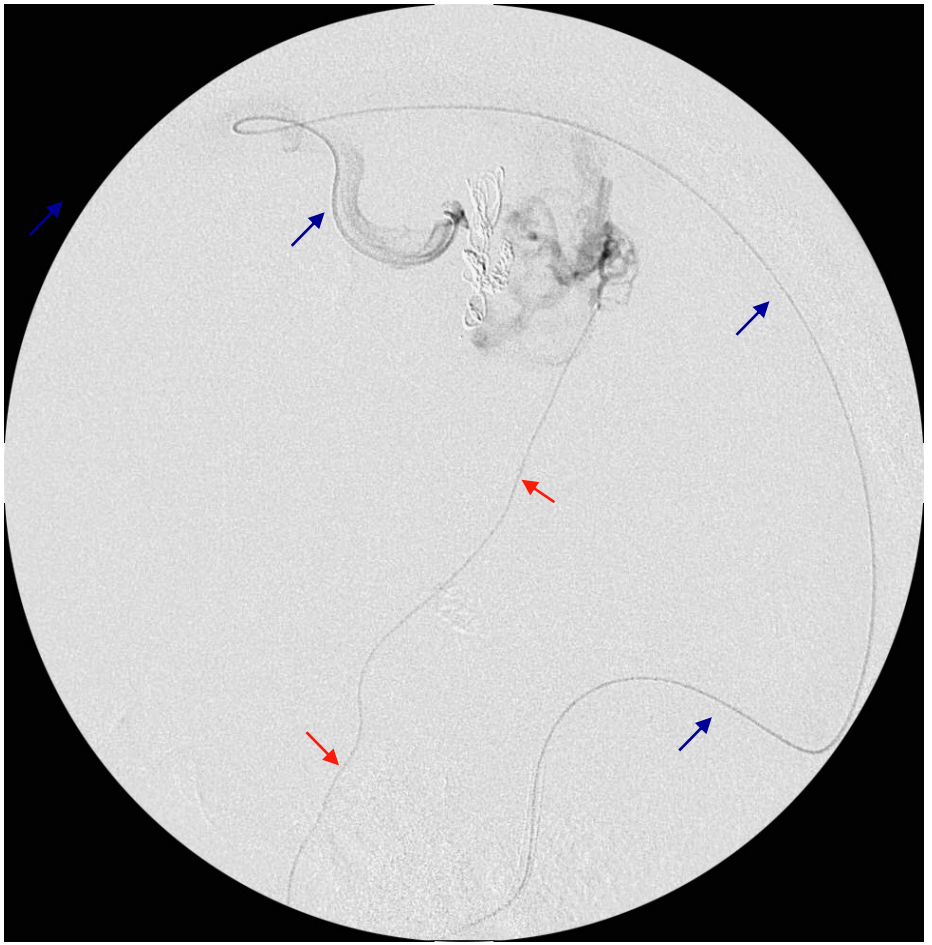
46 y female with intractable epilepsy.
She was embolised 6 times at an other hospital.



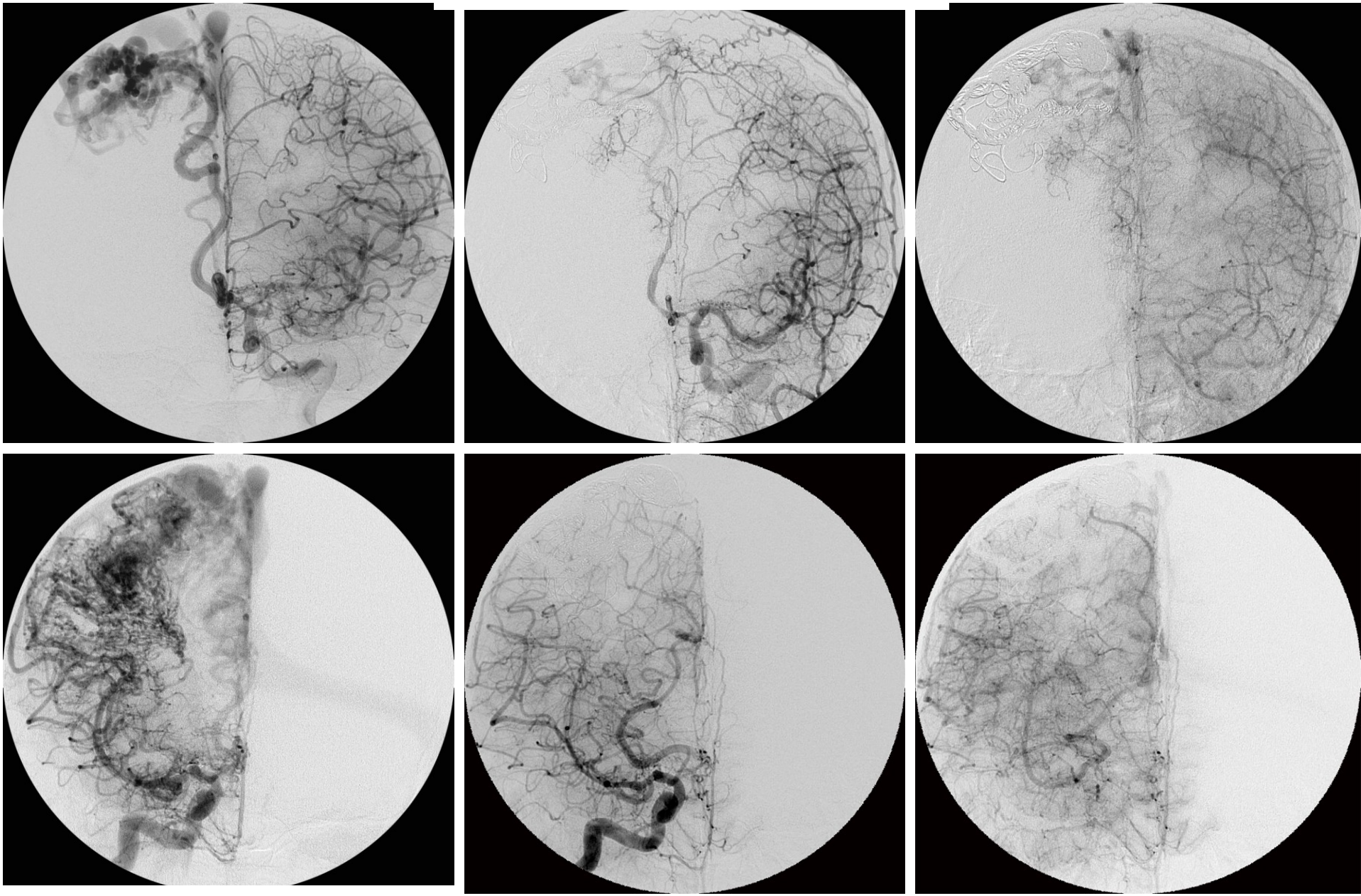
Occlusion of both A1 and development of moya-moya vessels

Catheterisation of the anterior cerebral artery is impossible through the moya-moya vessels.

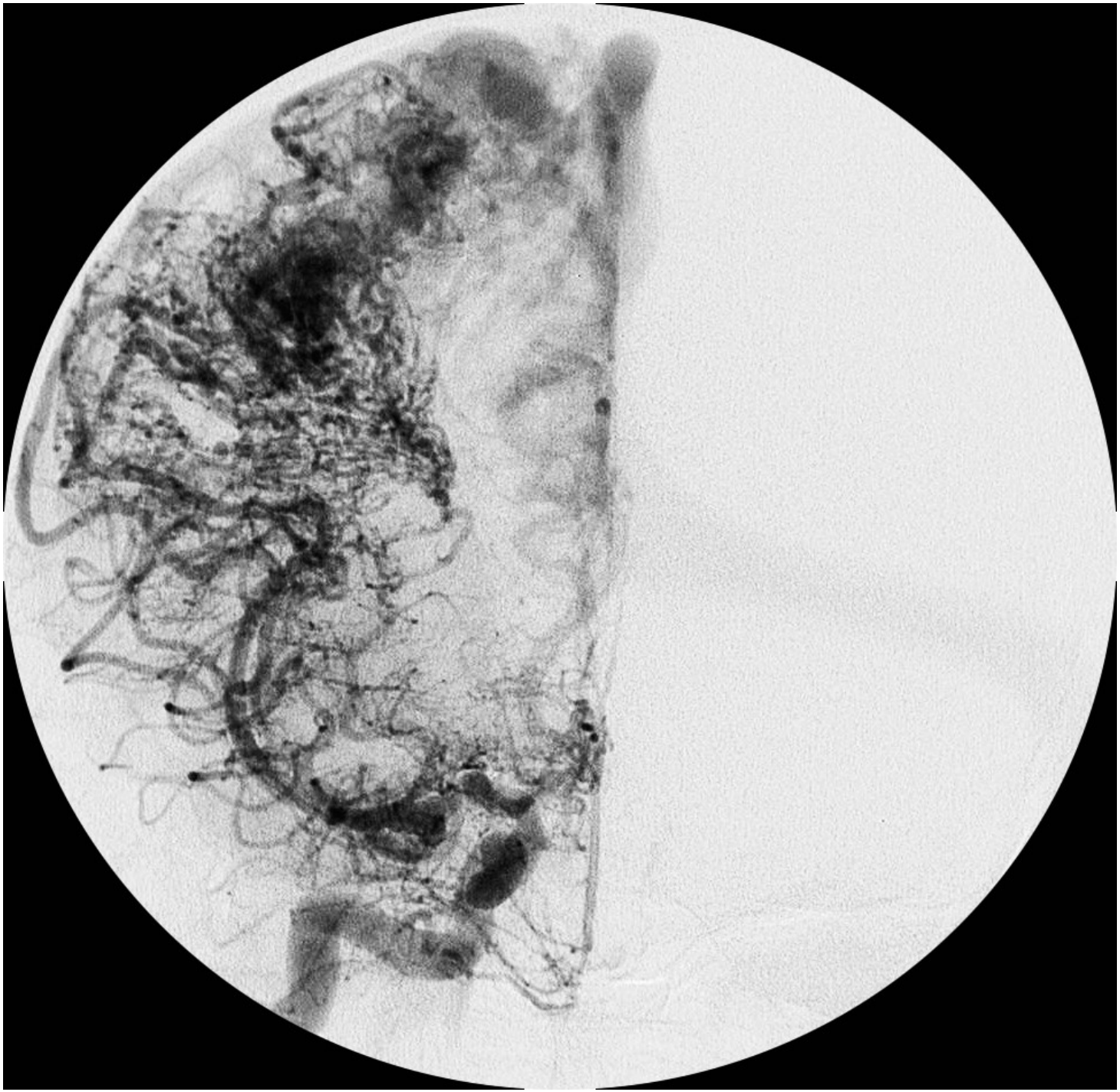
Transarterial-transvenous catheterisation of the AVM



Free of seizures for 5 y



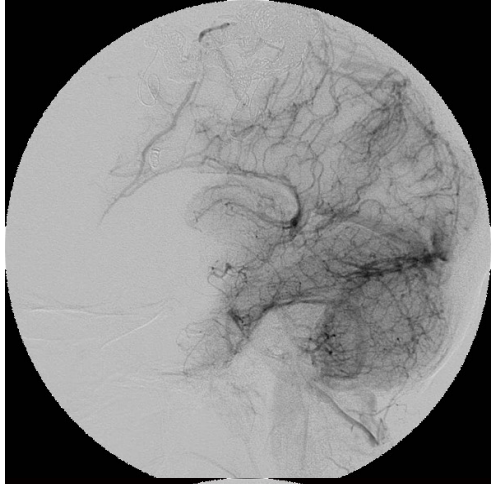
with partial arterial embolisation of the feeders !!!



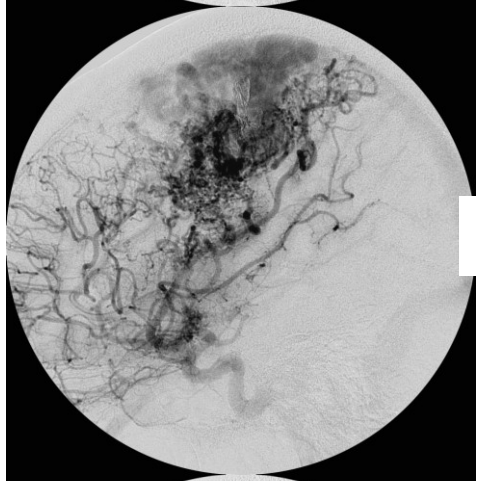
preop.

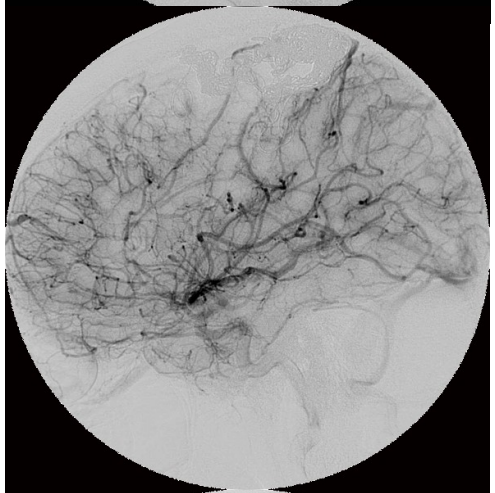
postop.

vert.

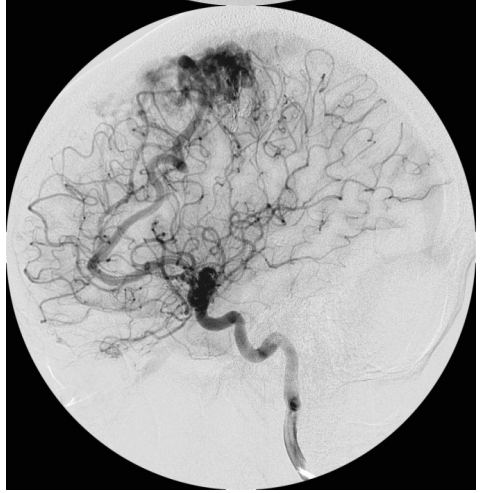


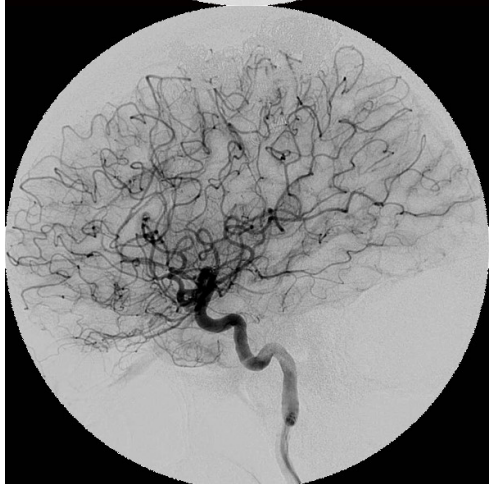
right carotis

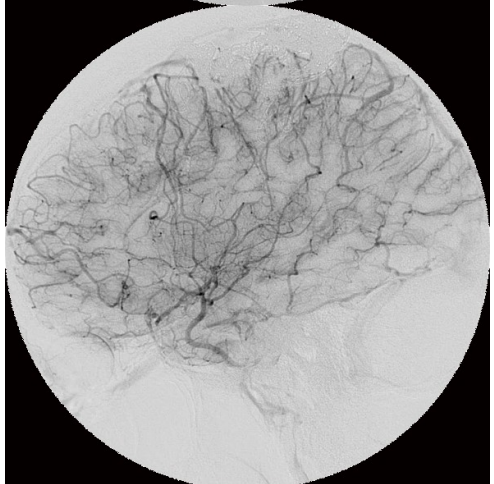




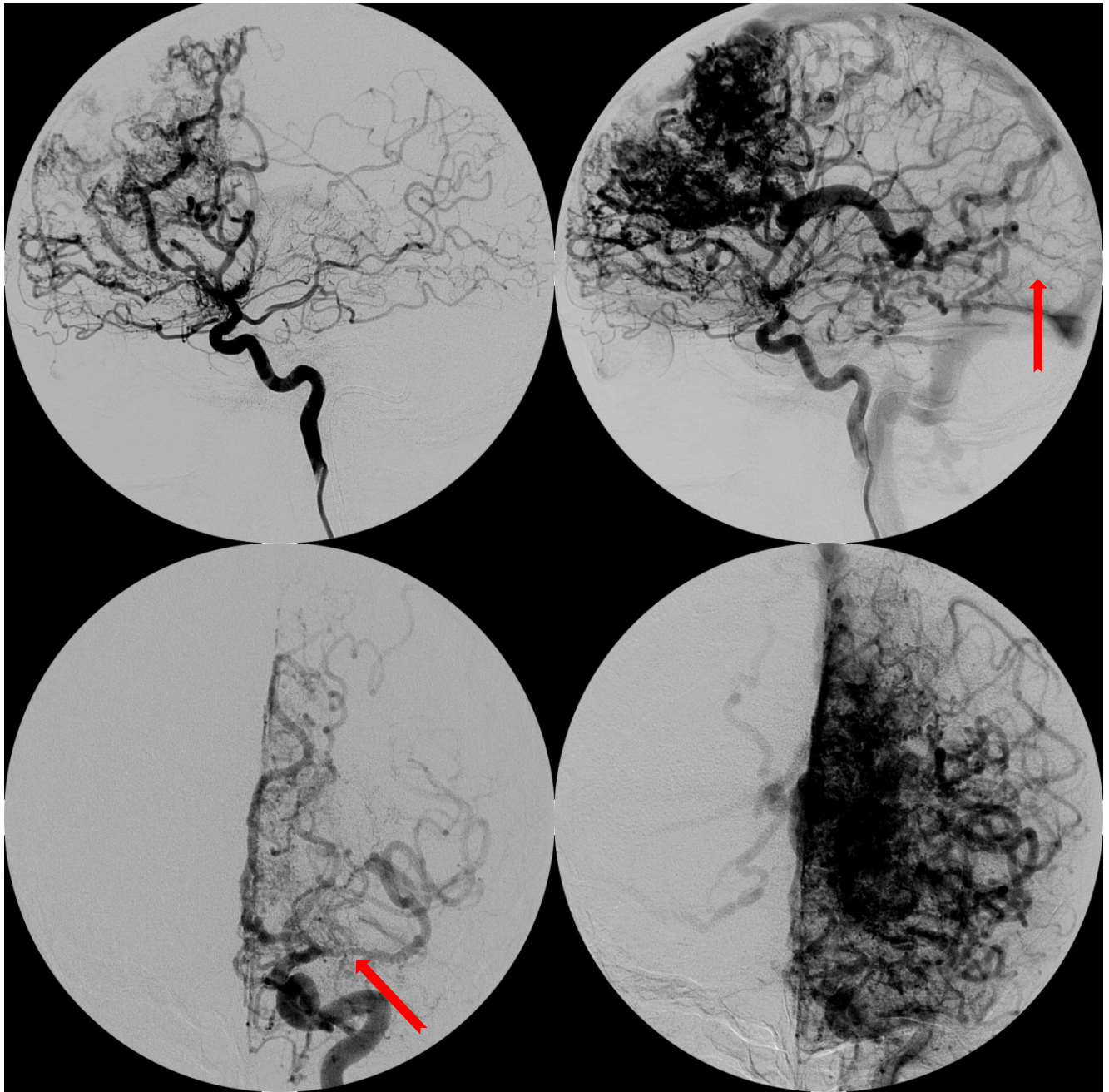
left carotis

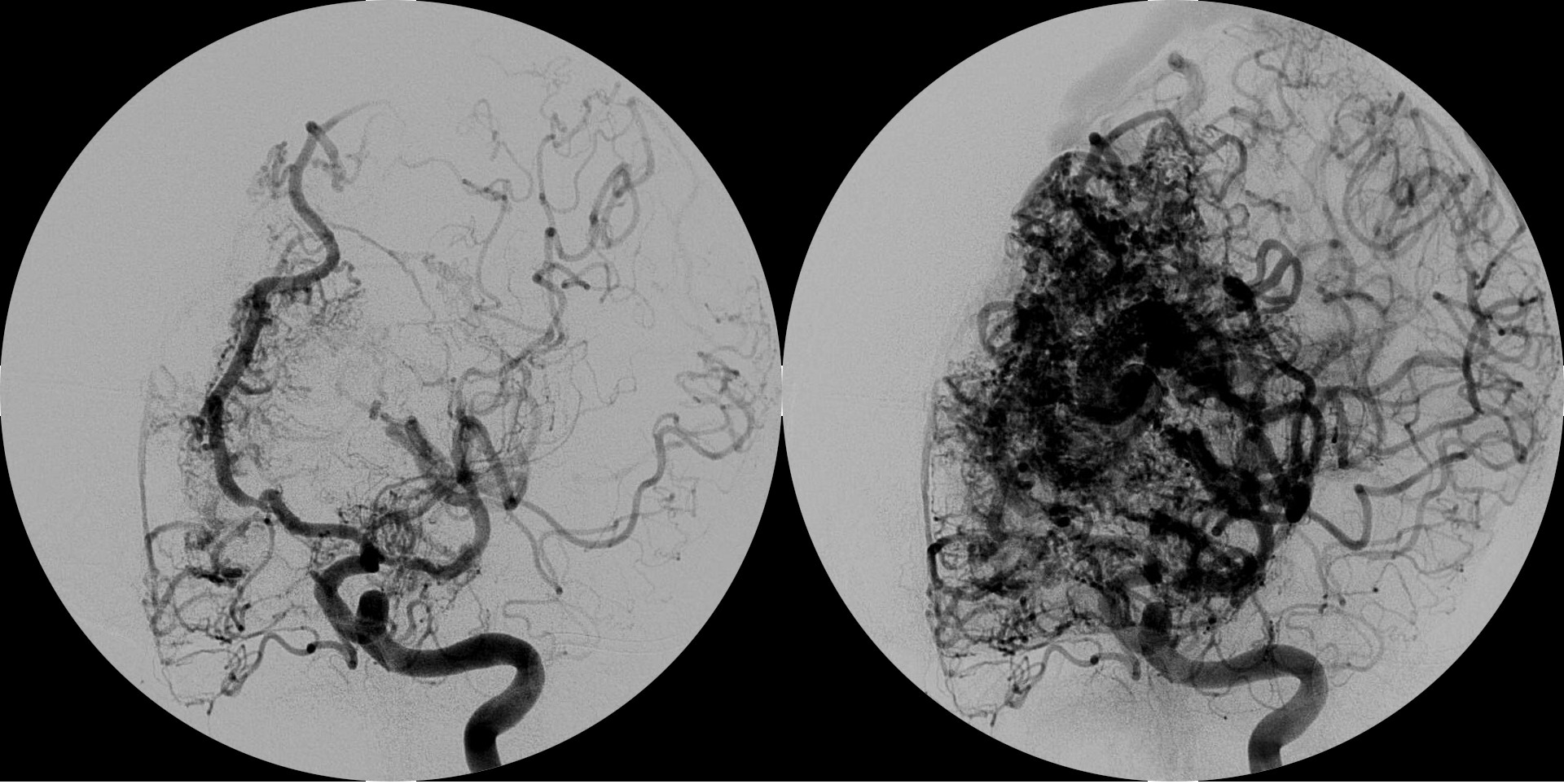


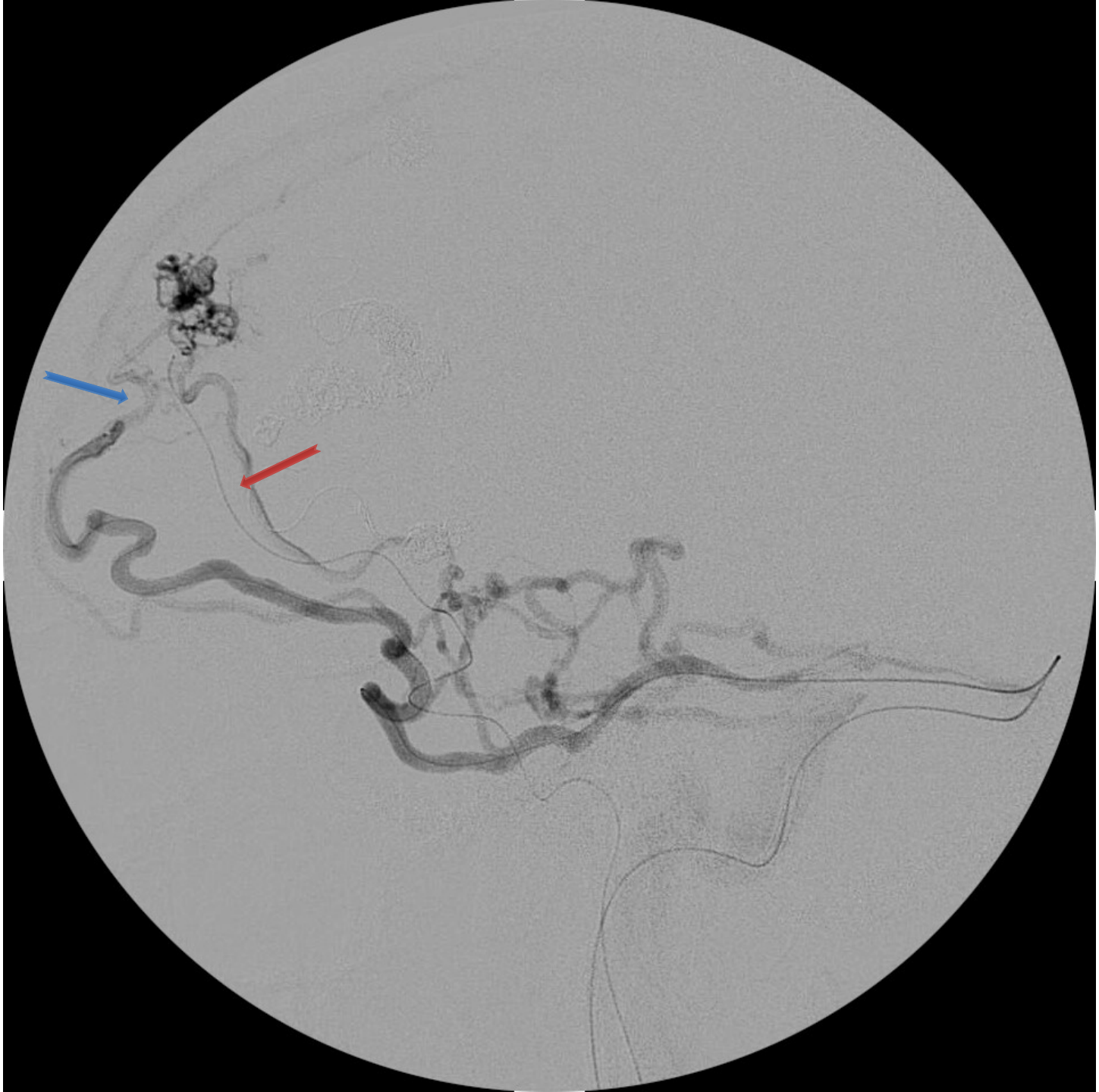


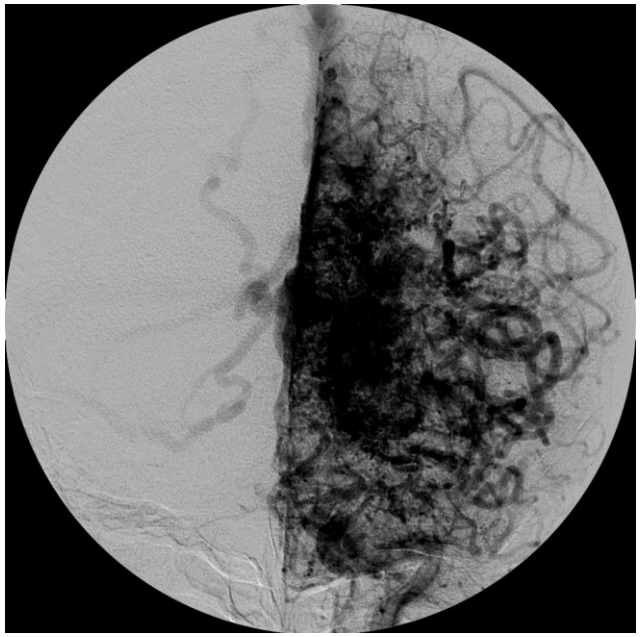


27y old female with intractable epilepsy. Previously she was embolised 7 times at an other hospital. The AVM is supplied by many feeders.

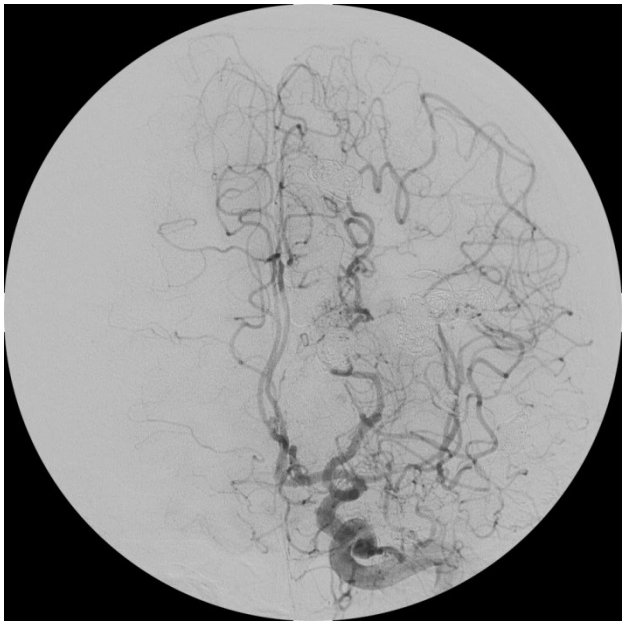


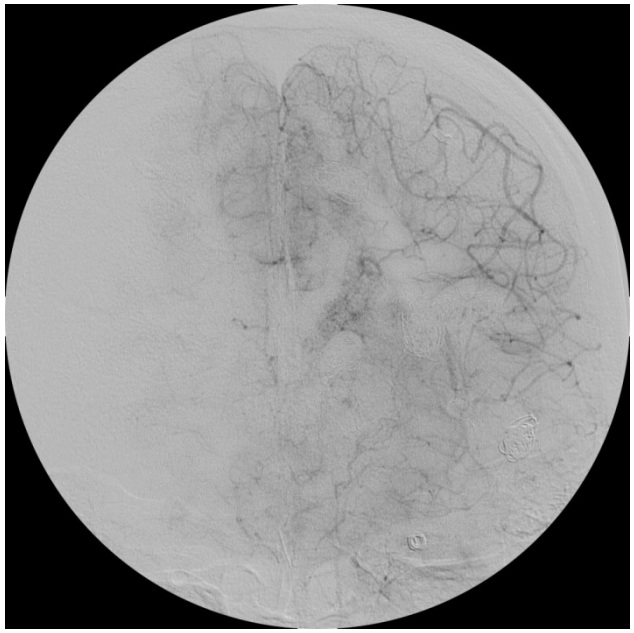


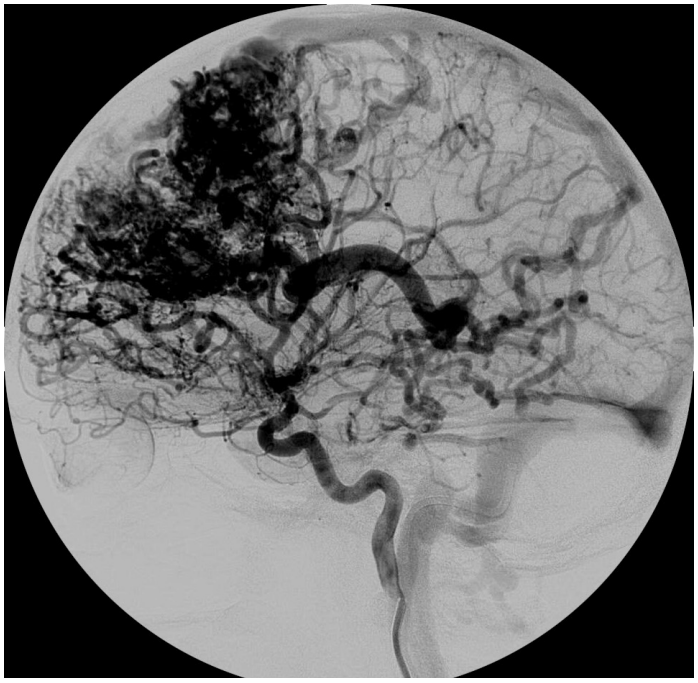




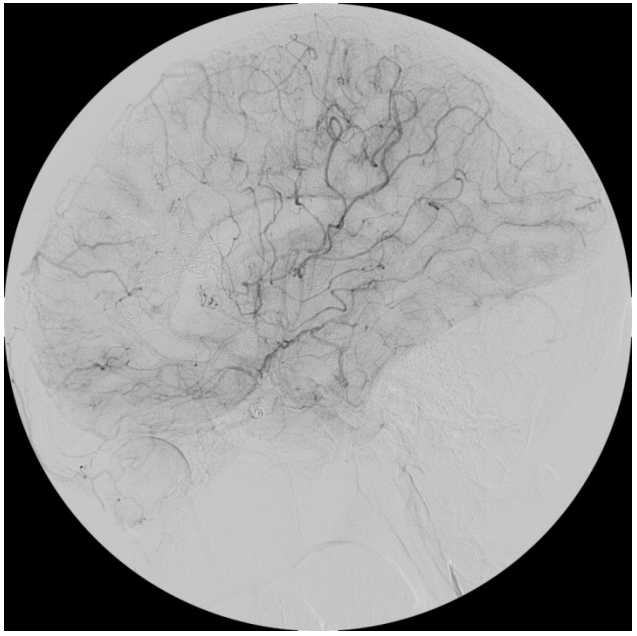
result was achieved after 4 operations.

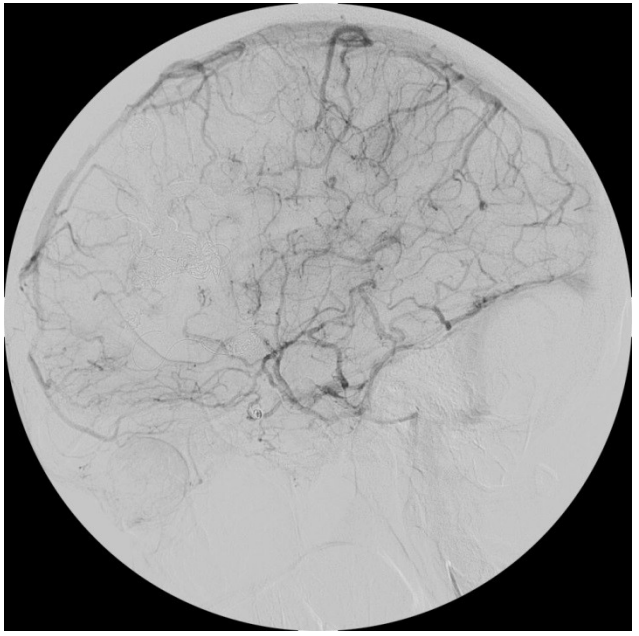


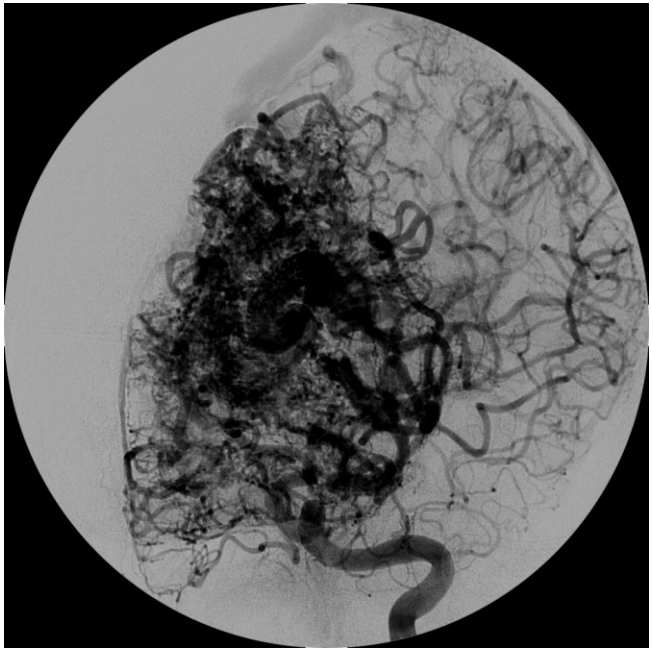


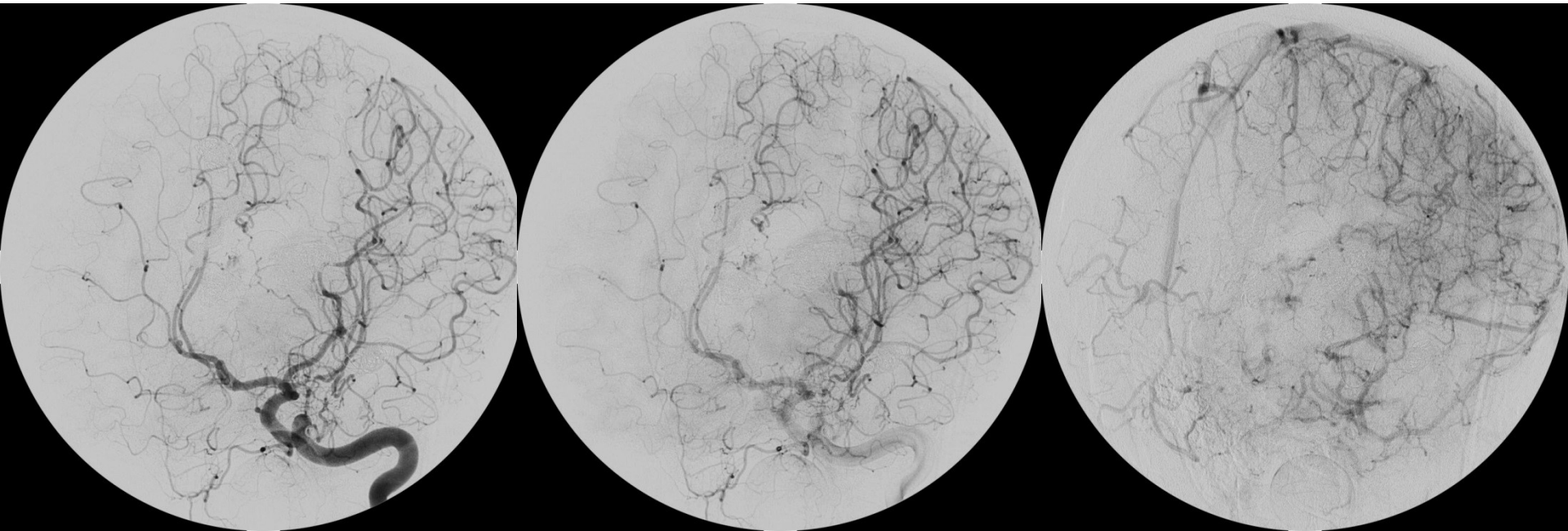


result was achieved after 4 operations.



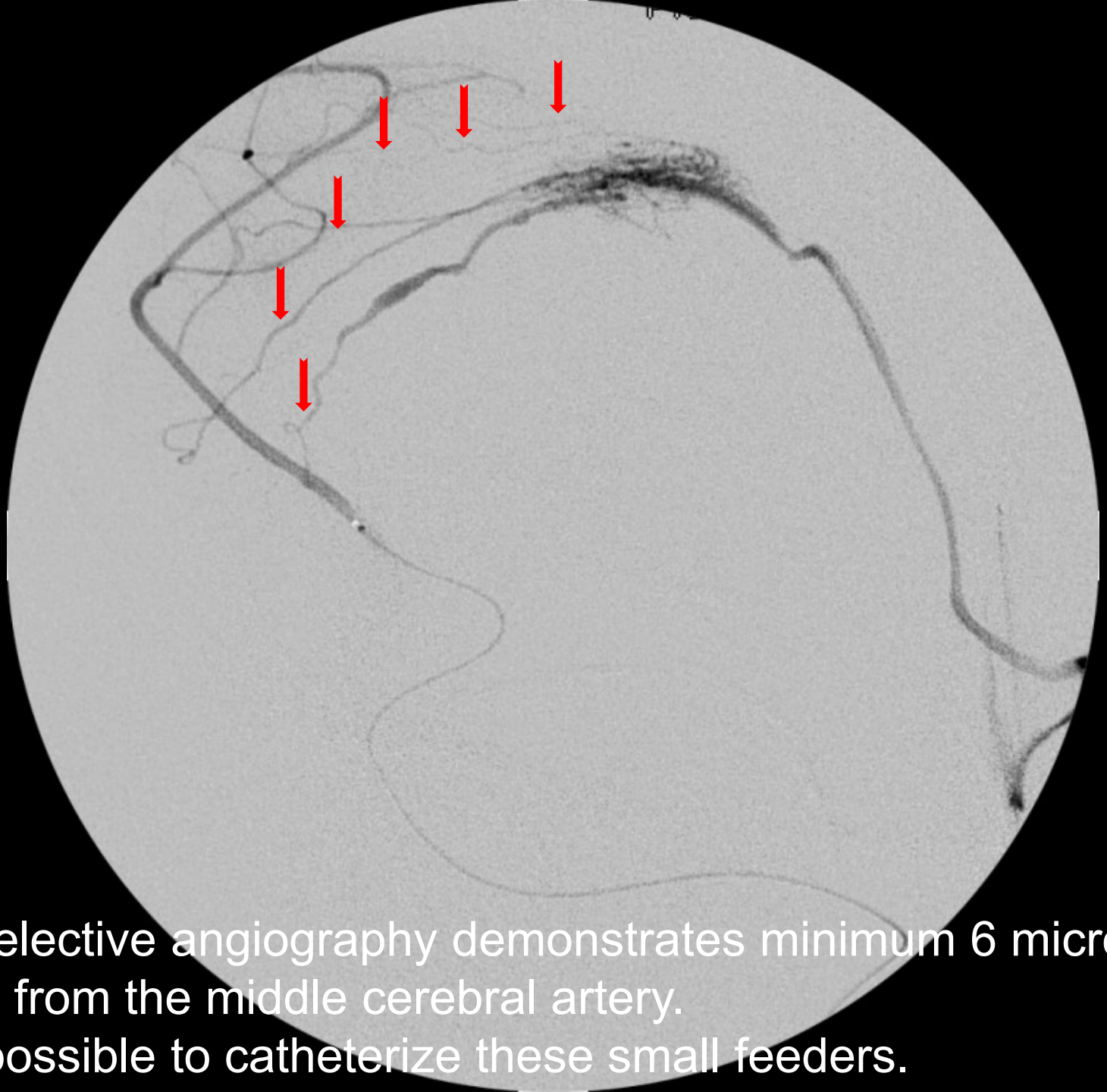




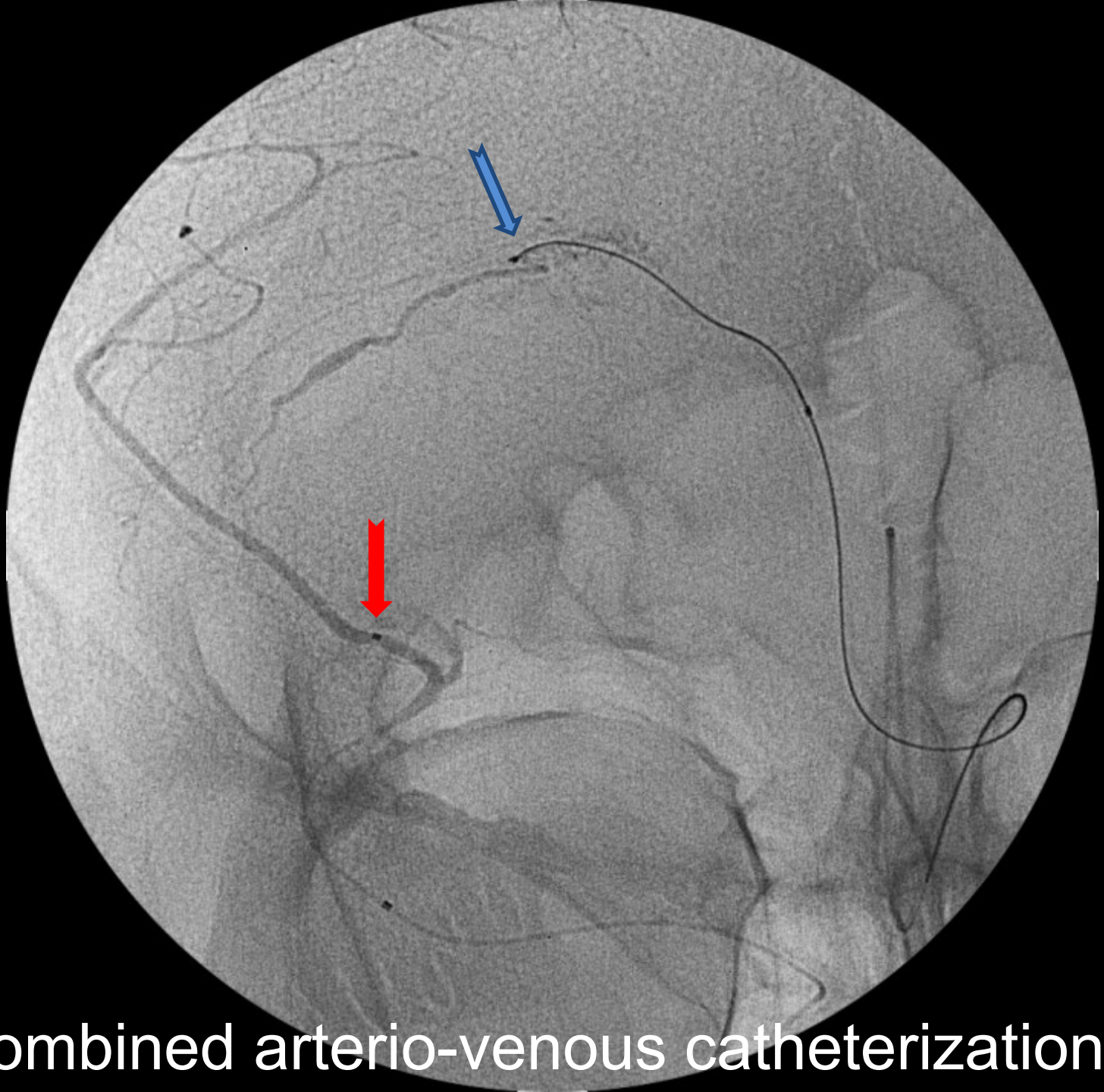


micromalformations

30y old male presenting with intracerebral hemorrhage.

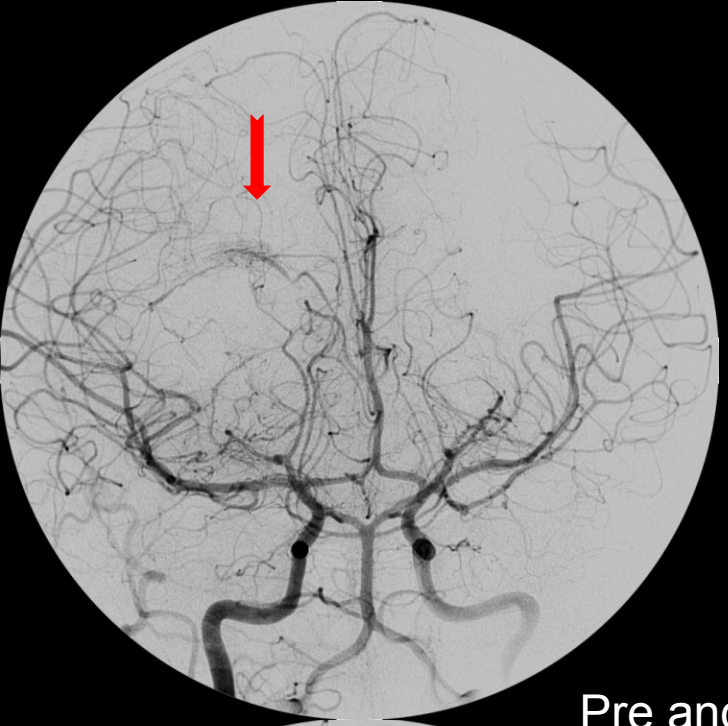


Superselective angiography demonstrates minimum 6 micro feeders from the middle cerebral artery.
It is impossible to catheterize these small feeders.



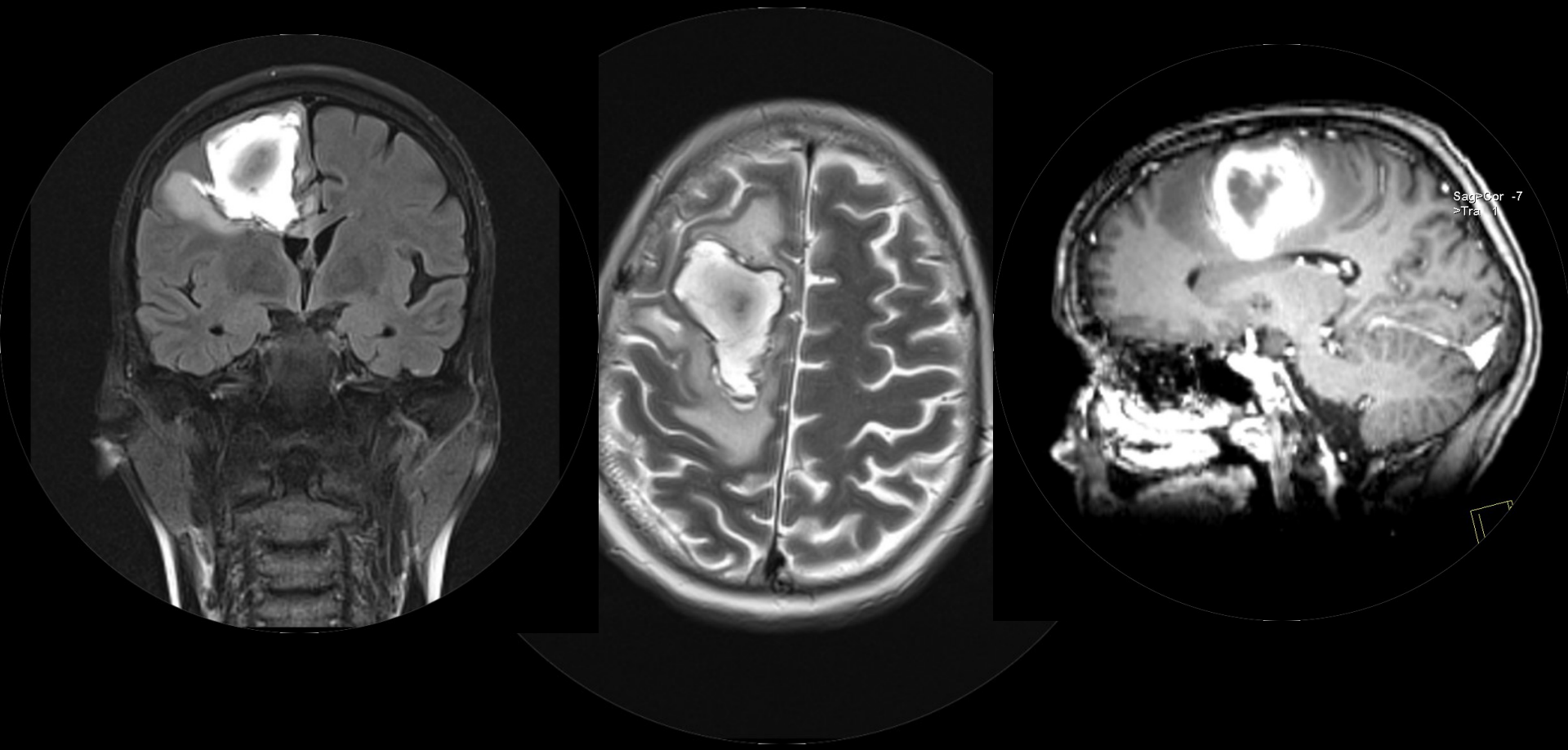
Combined arterio-venous catheterization

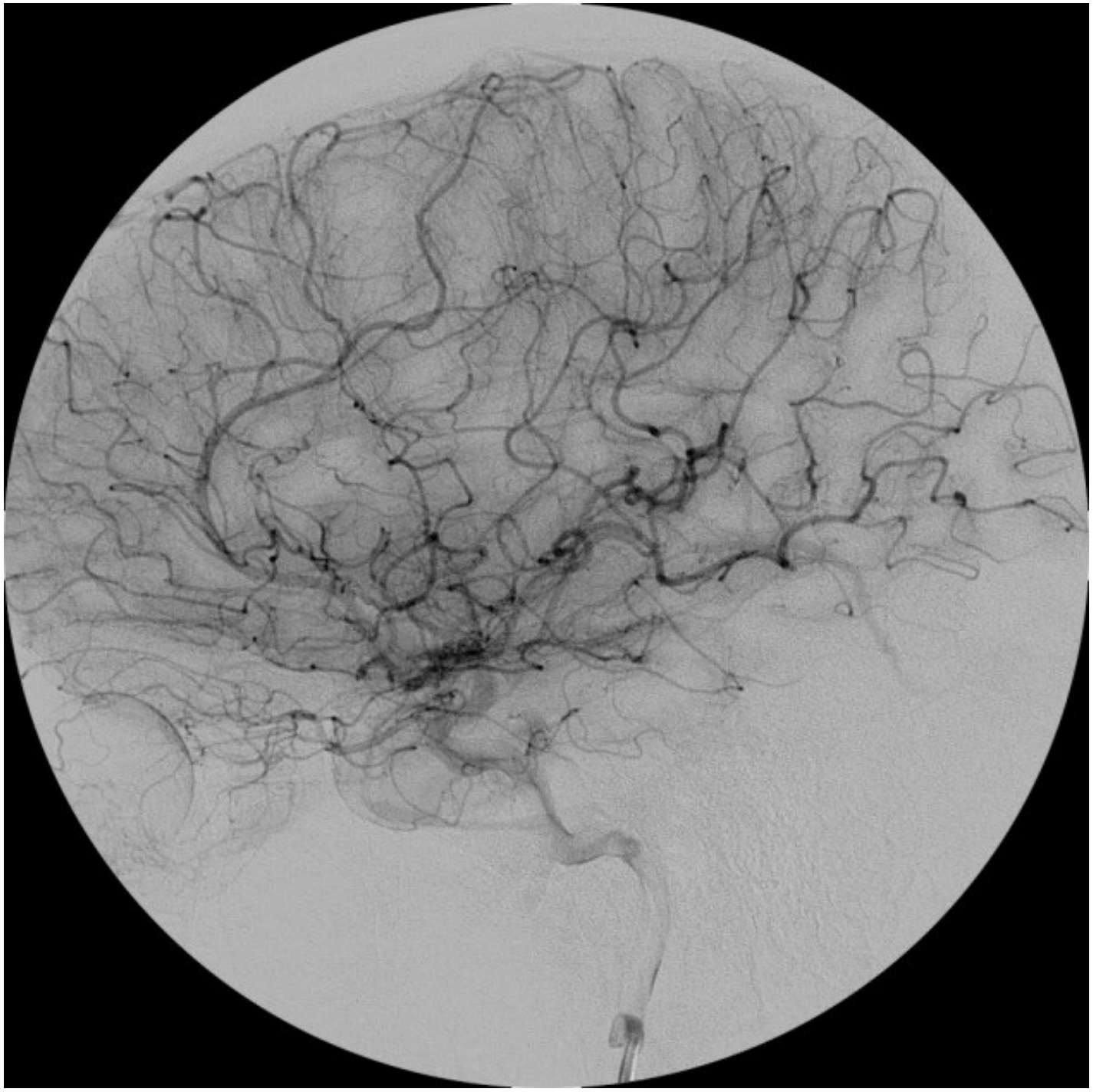
Liquid polymer in the AVM nidus

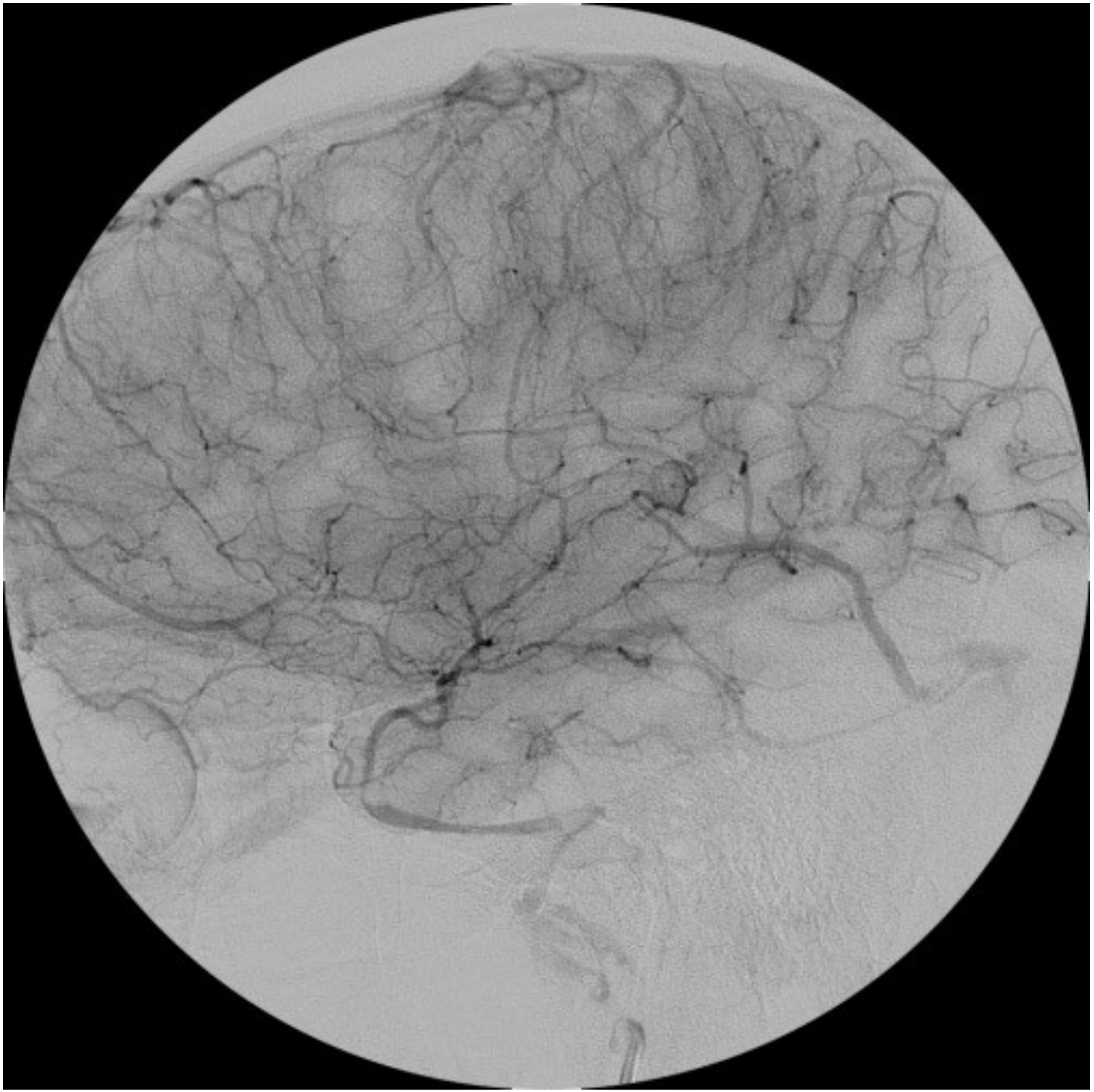


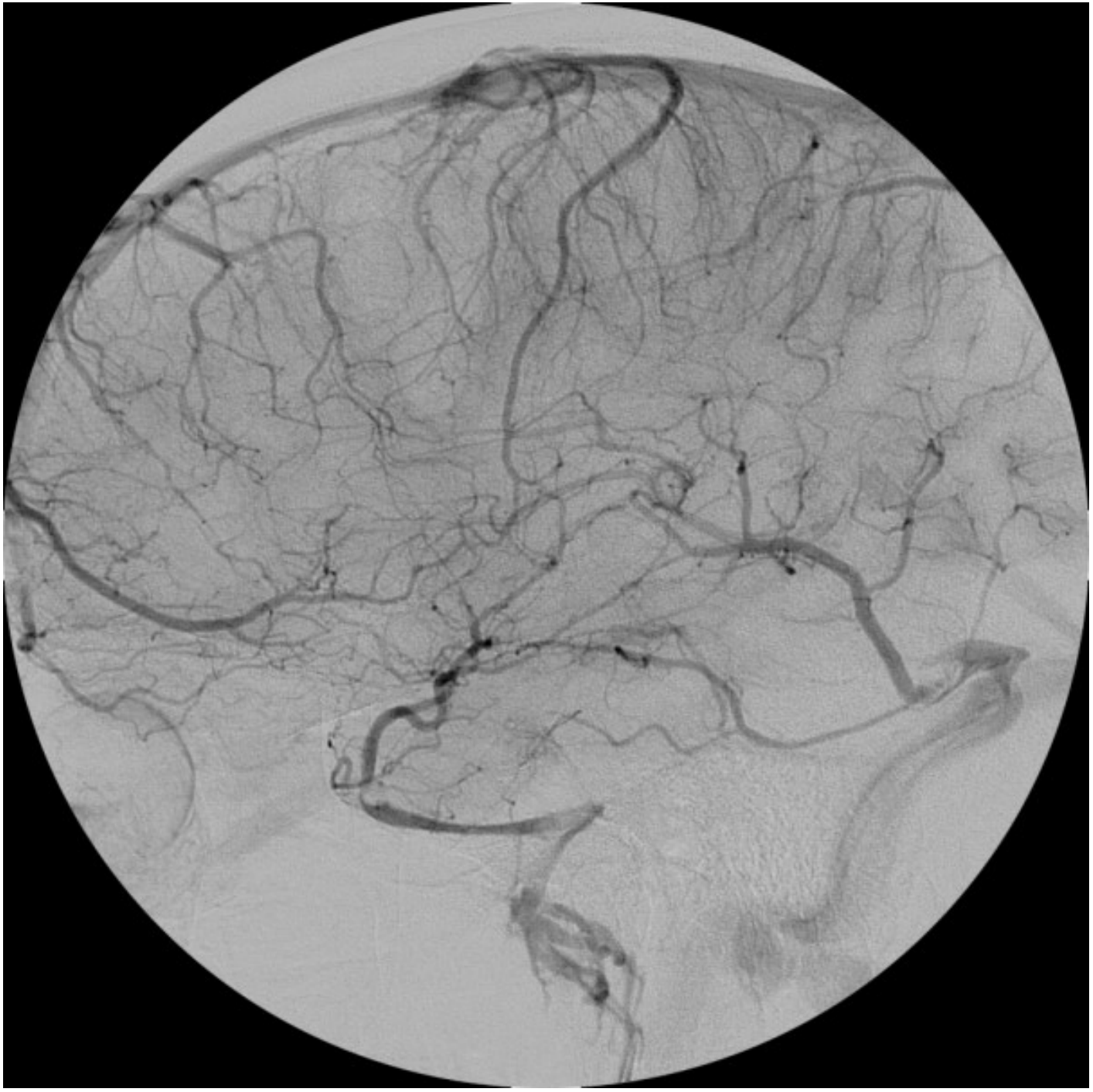

Pre and post-operativ DSA images

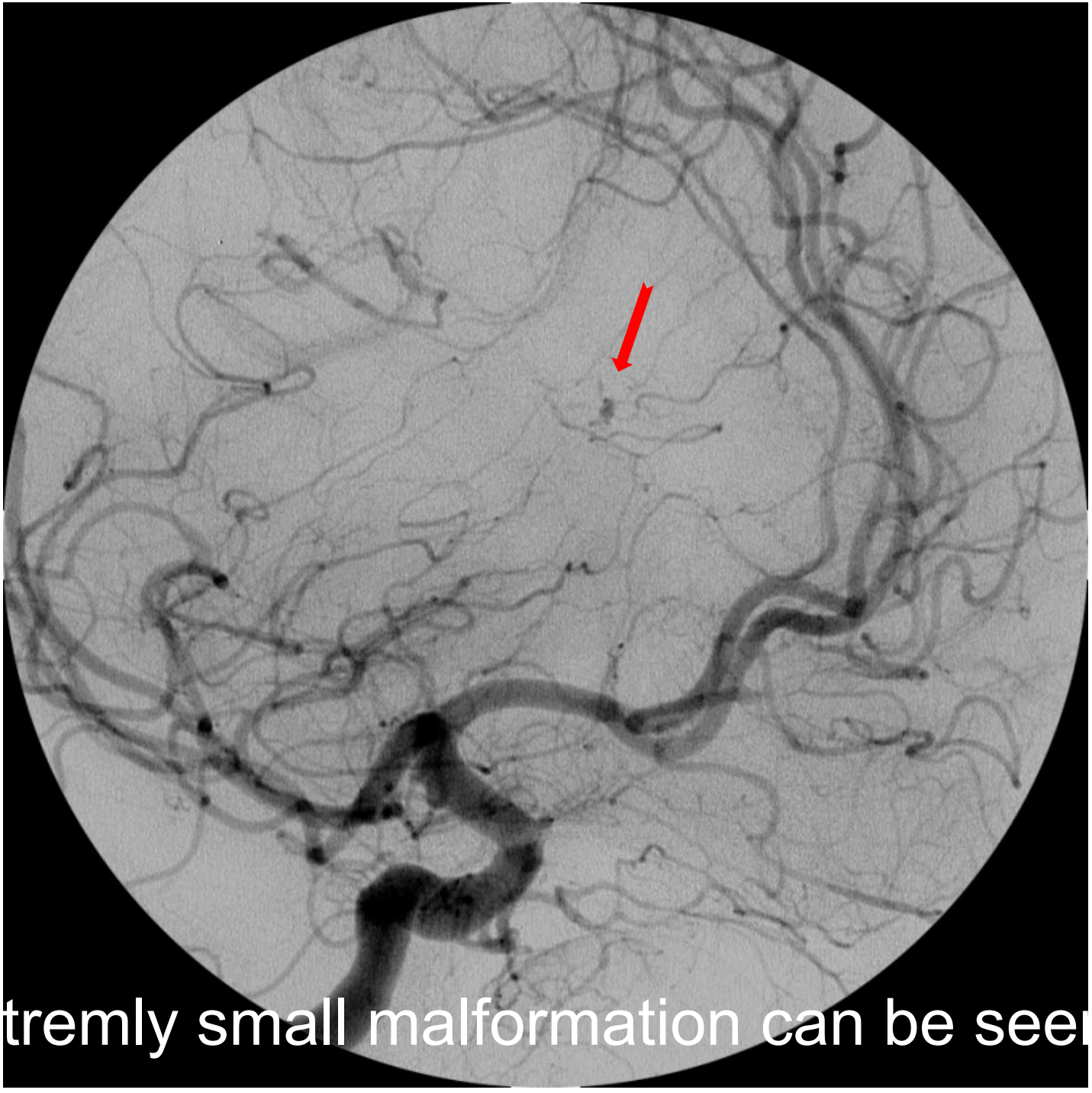
Young male patient with massive intracerebral hemorrhage



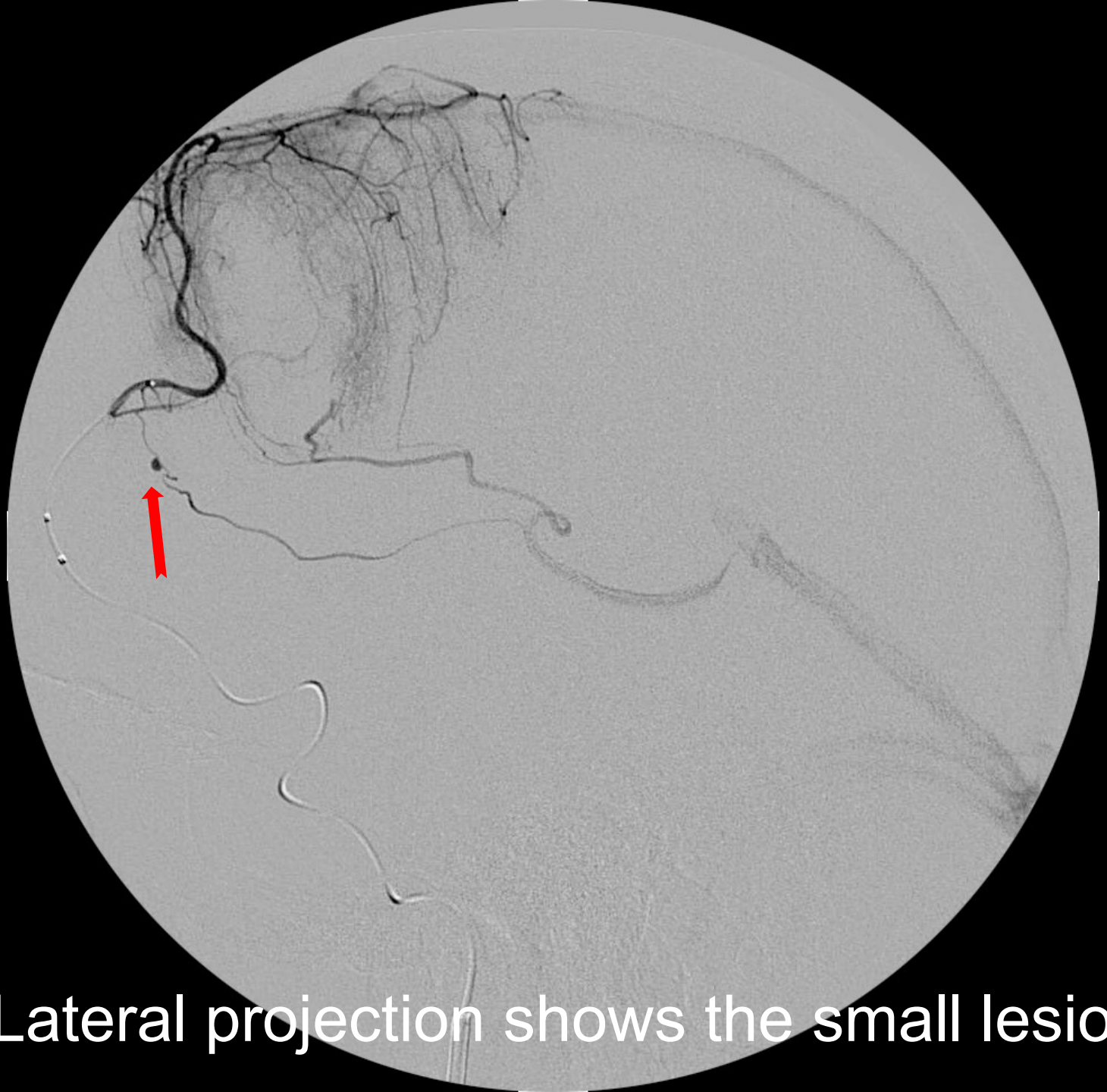




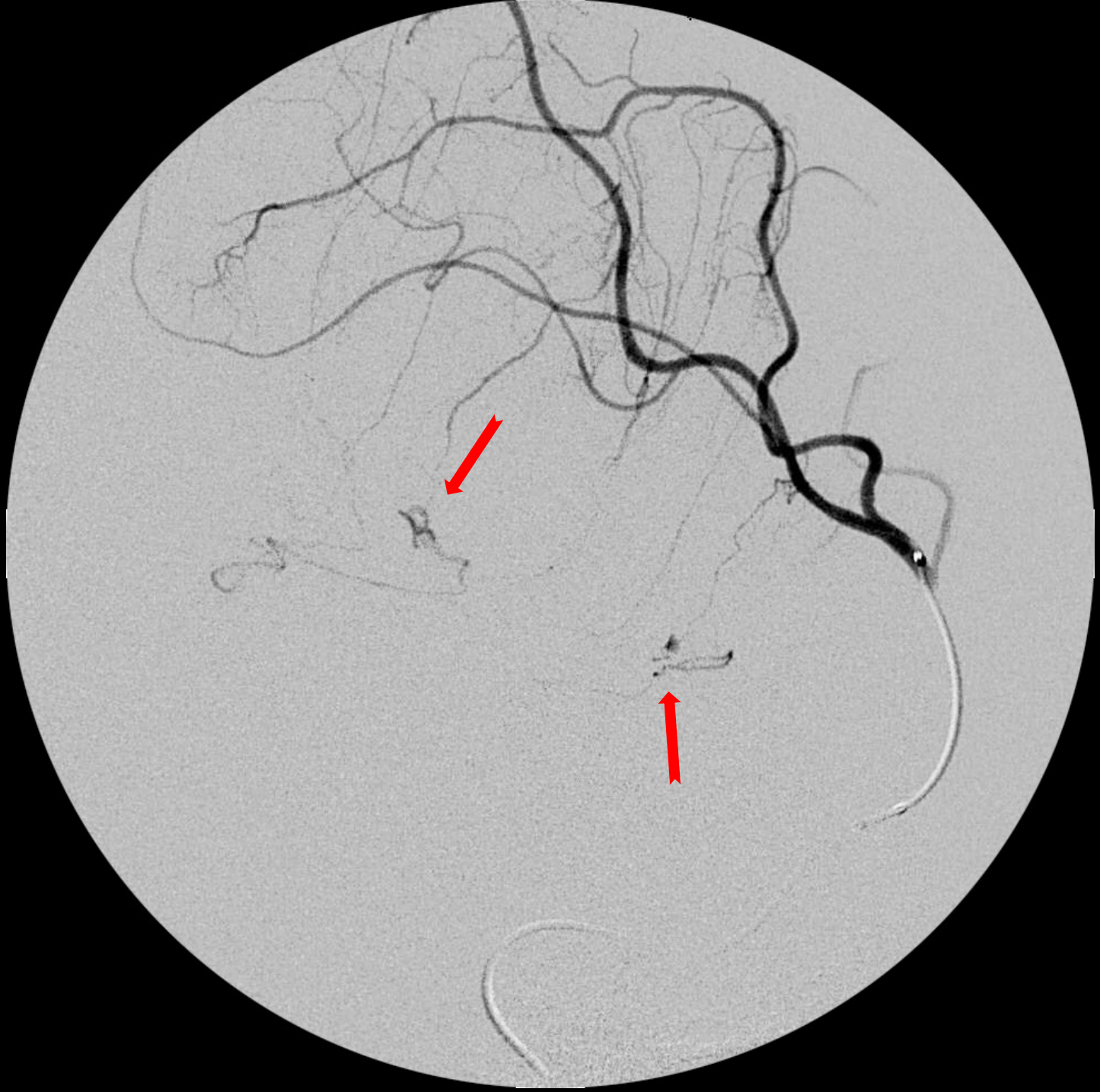


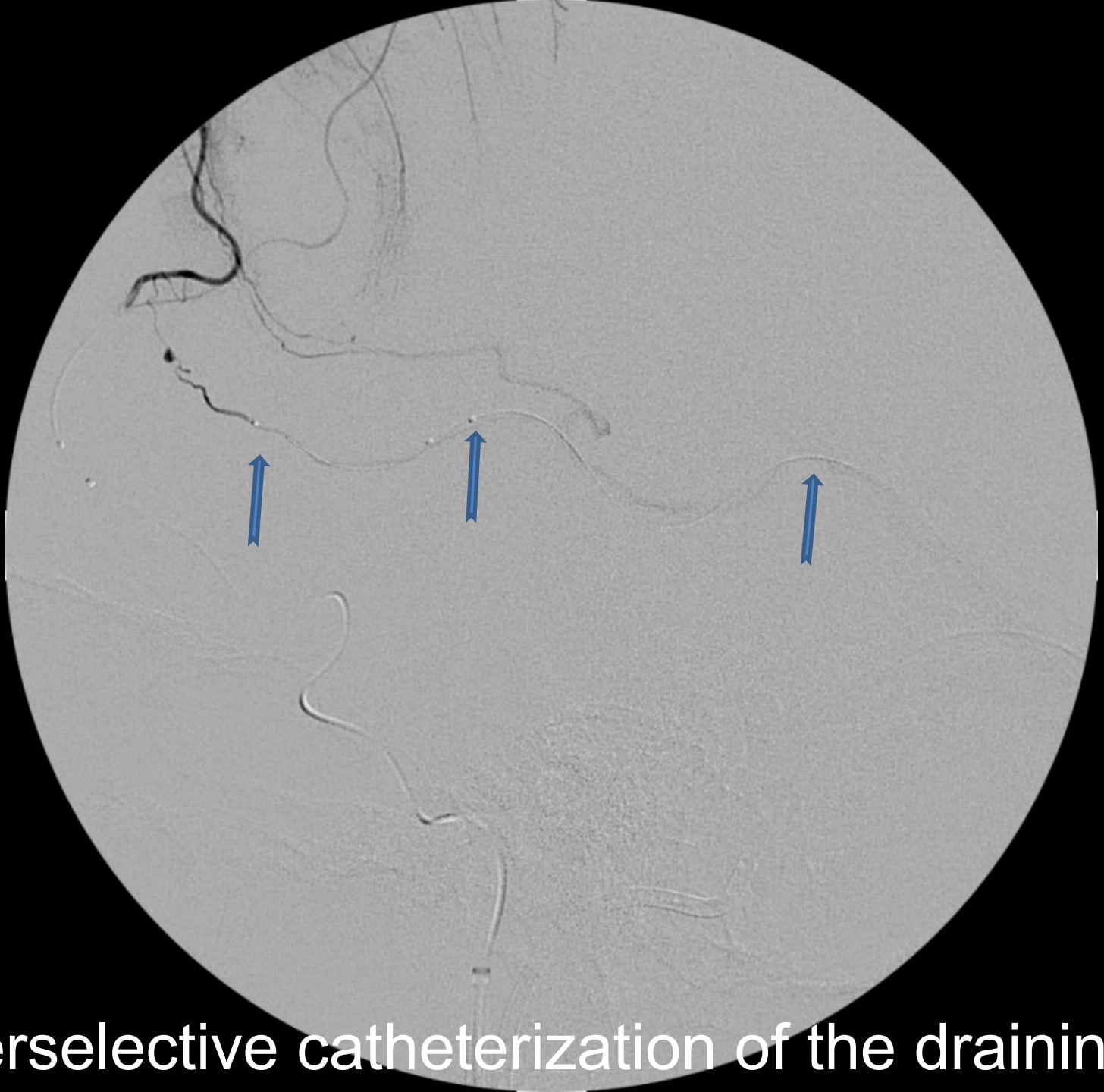

tremly small malformation can be see

Superselective angiography verified the presence of the microAVM.
Its very small feeder from the anterior cerebral artery can not be catheterized .

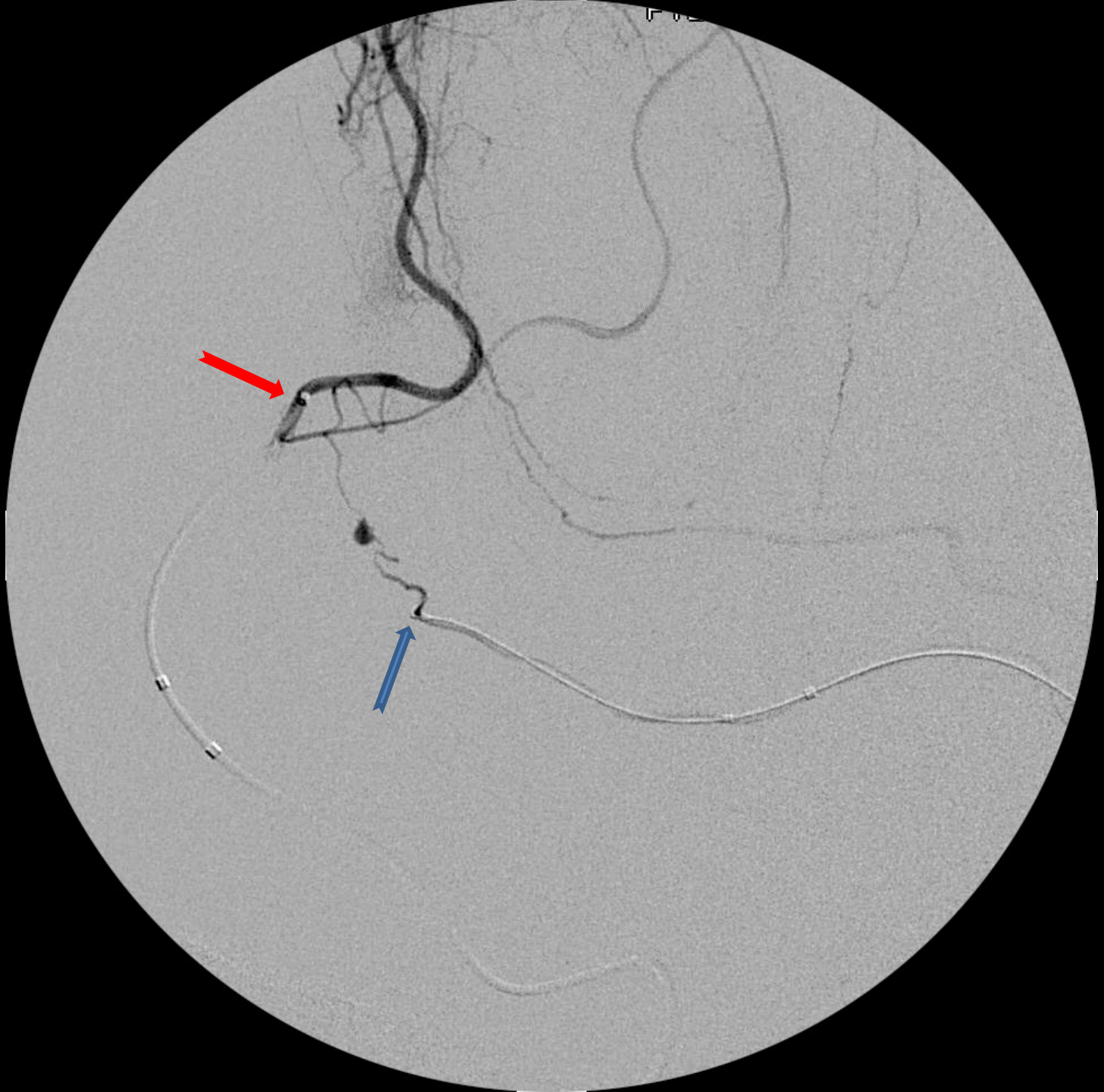


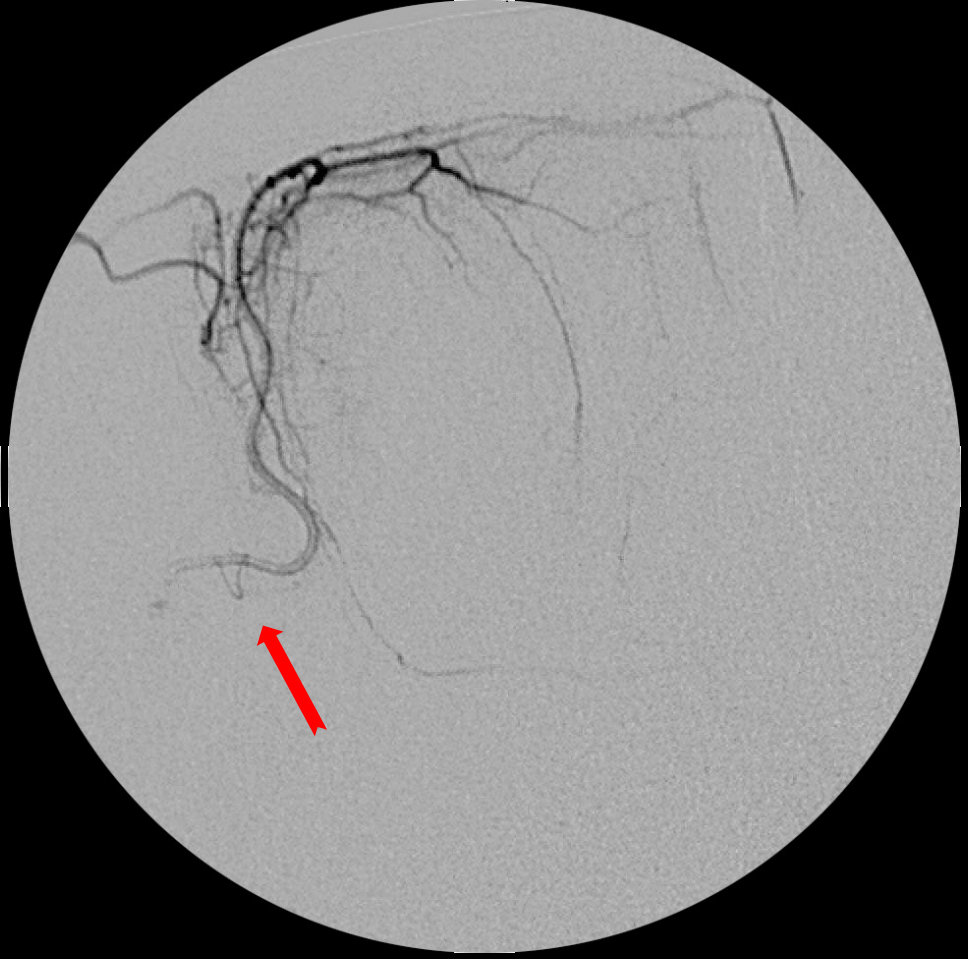
Lateral projection shows the small lesion



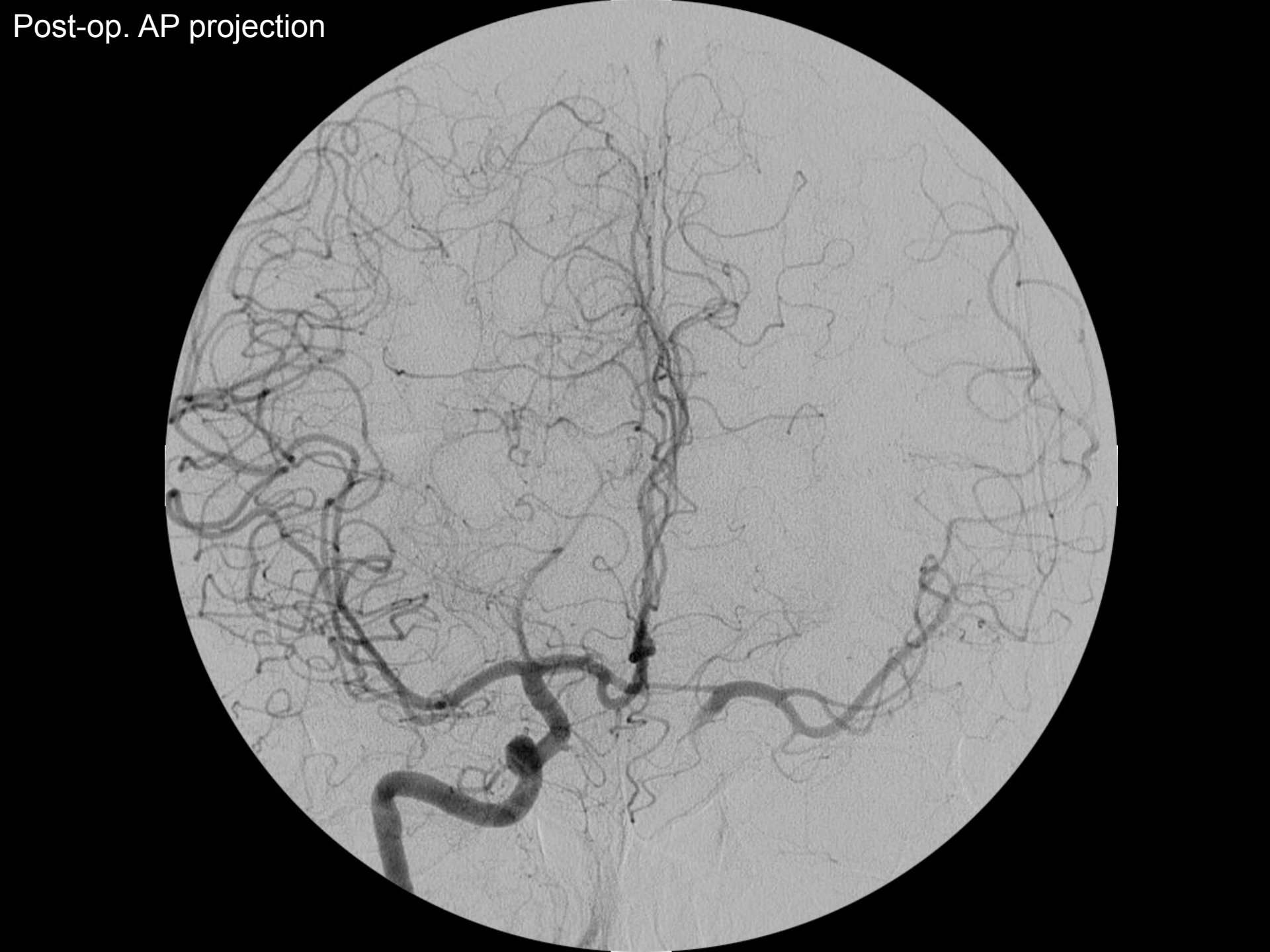


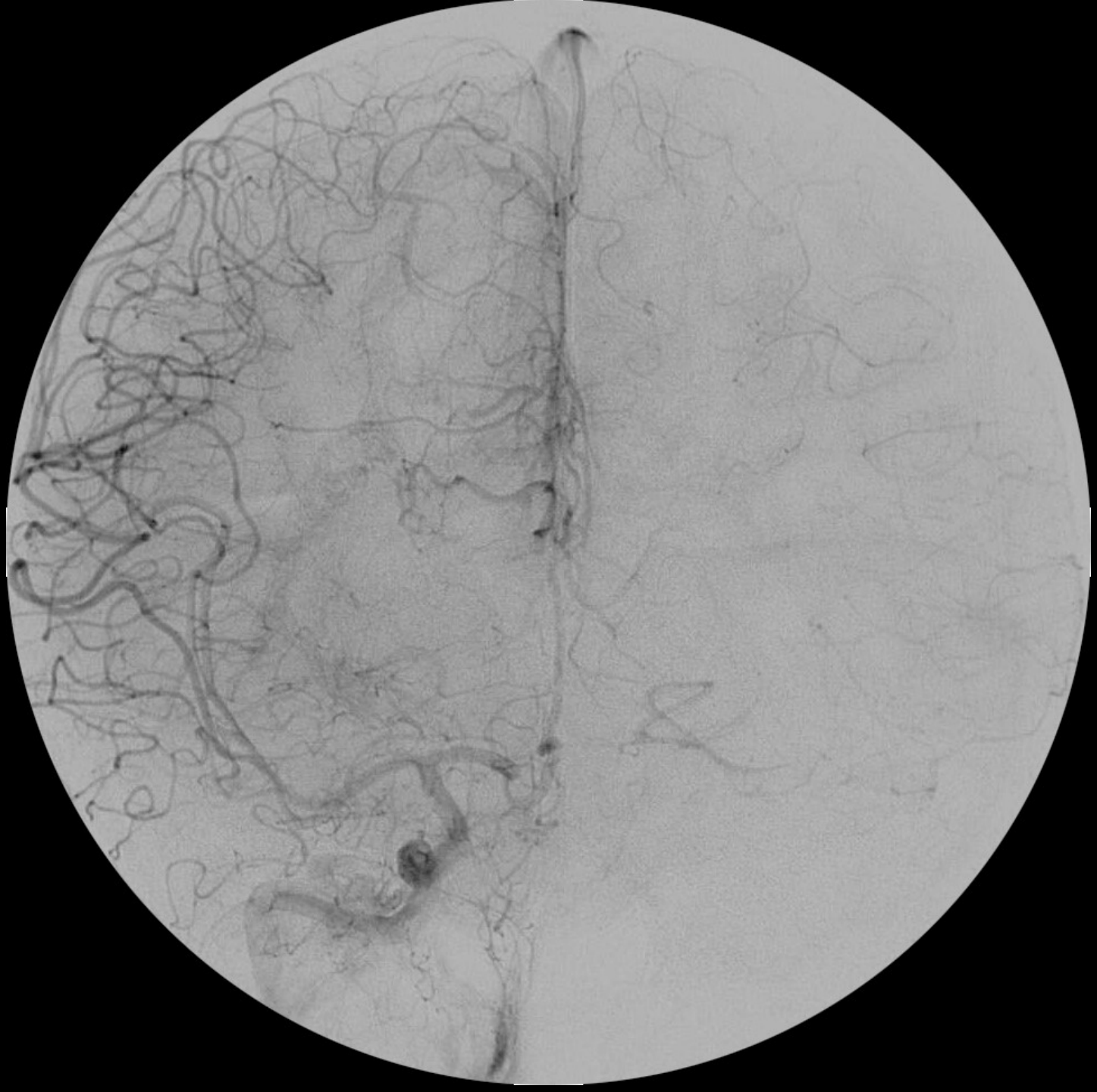
Superselective catheterization of the draining vein.

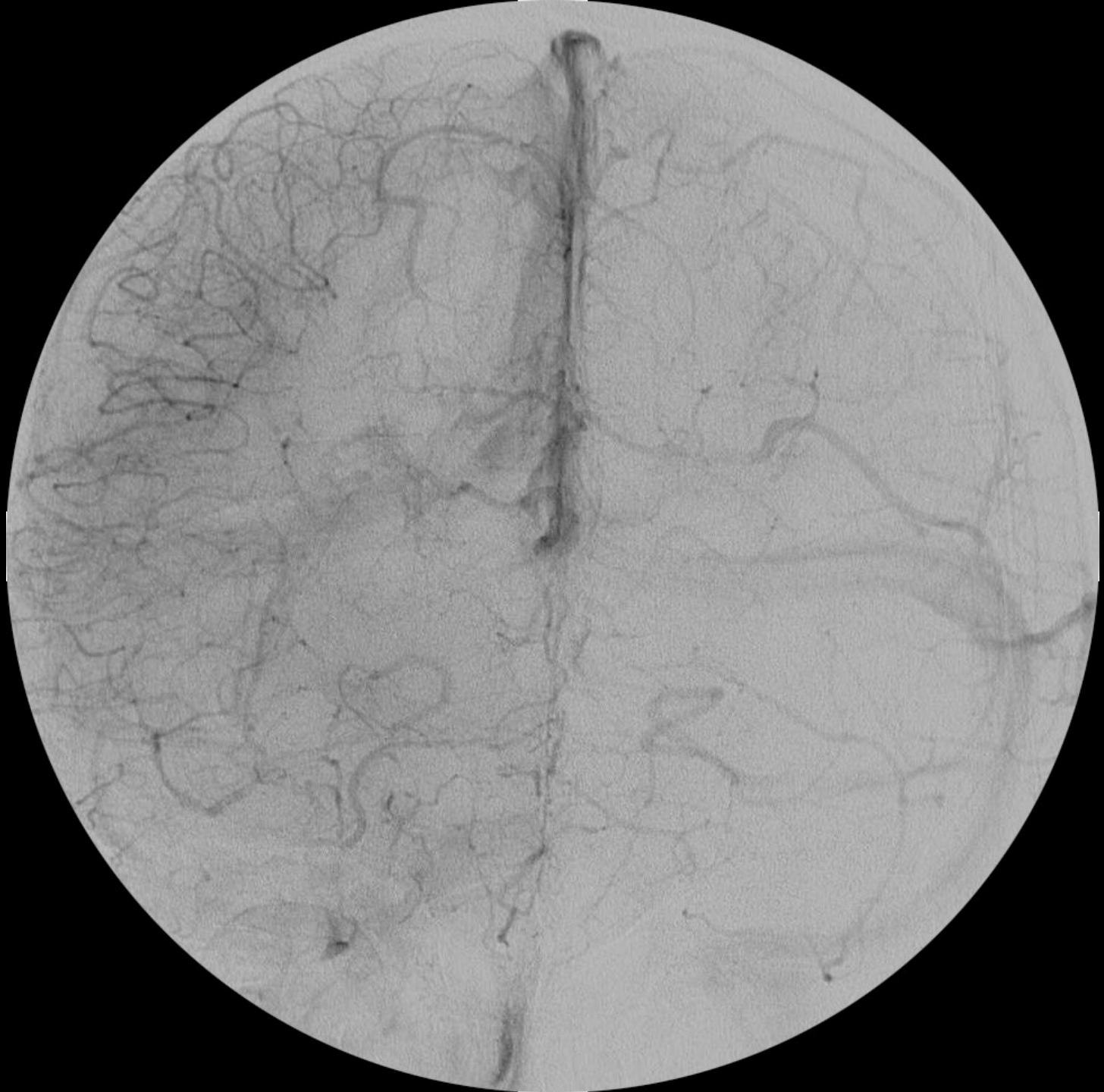


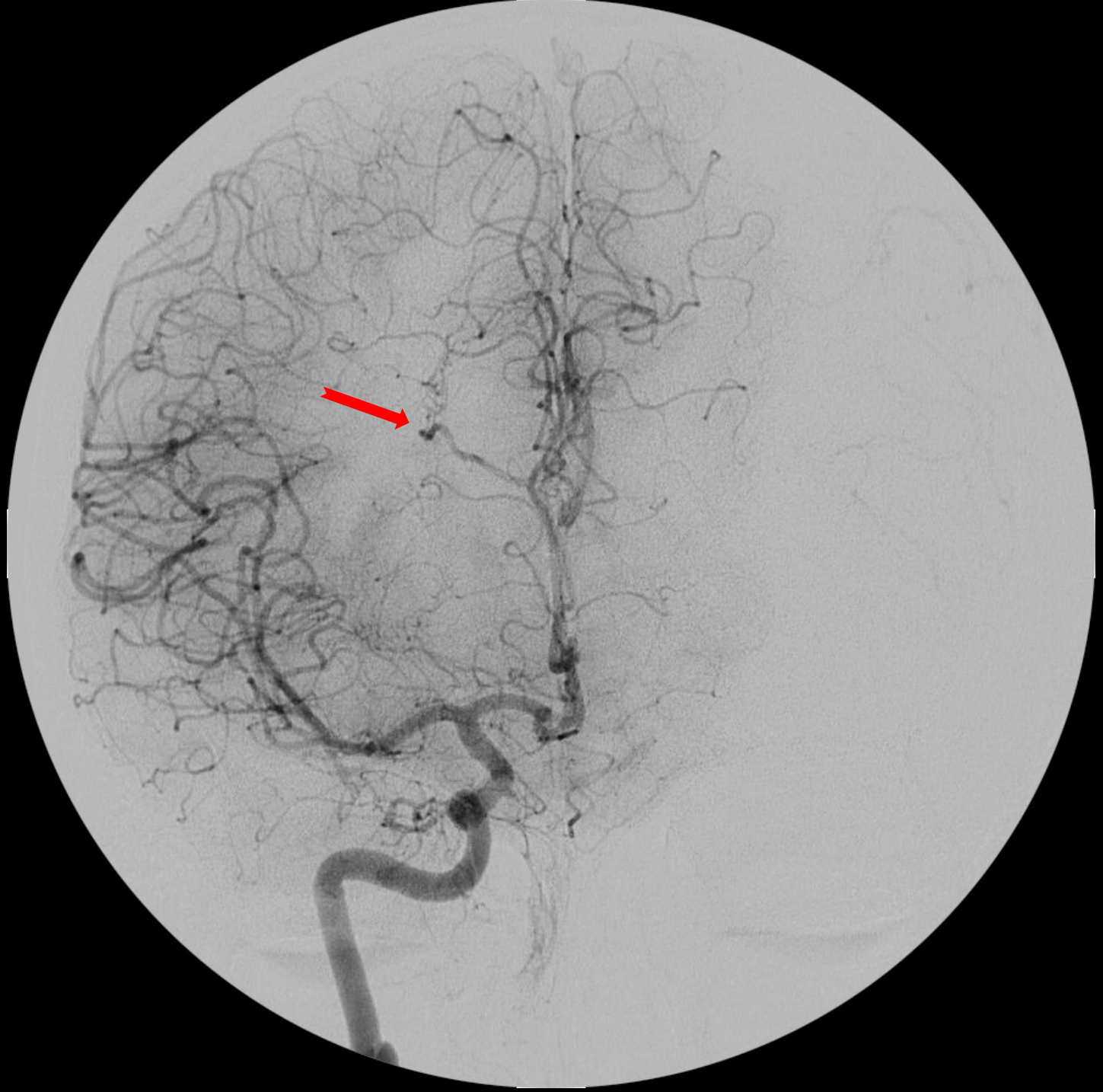


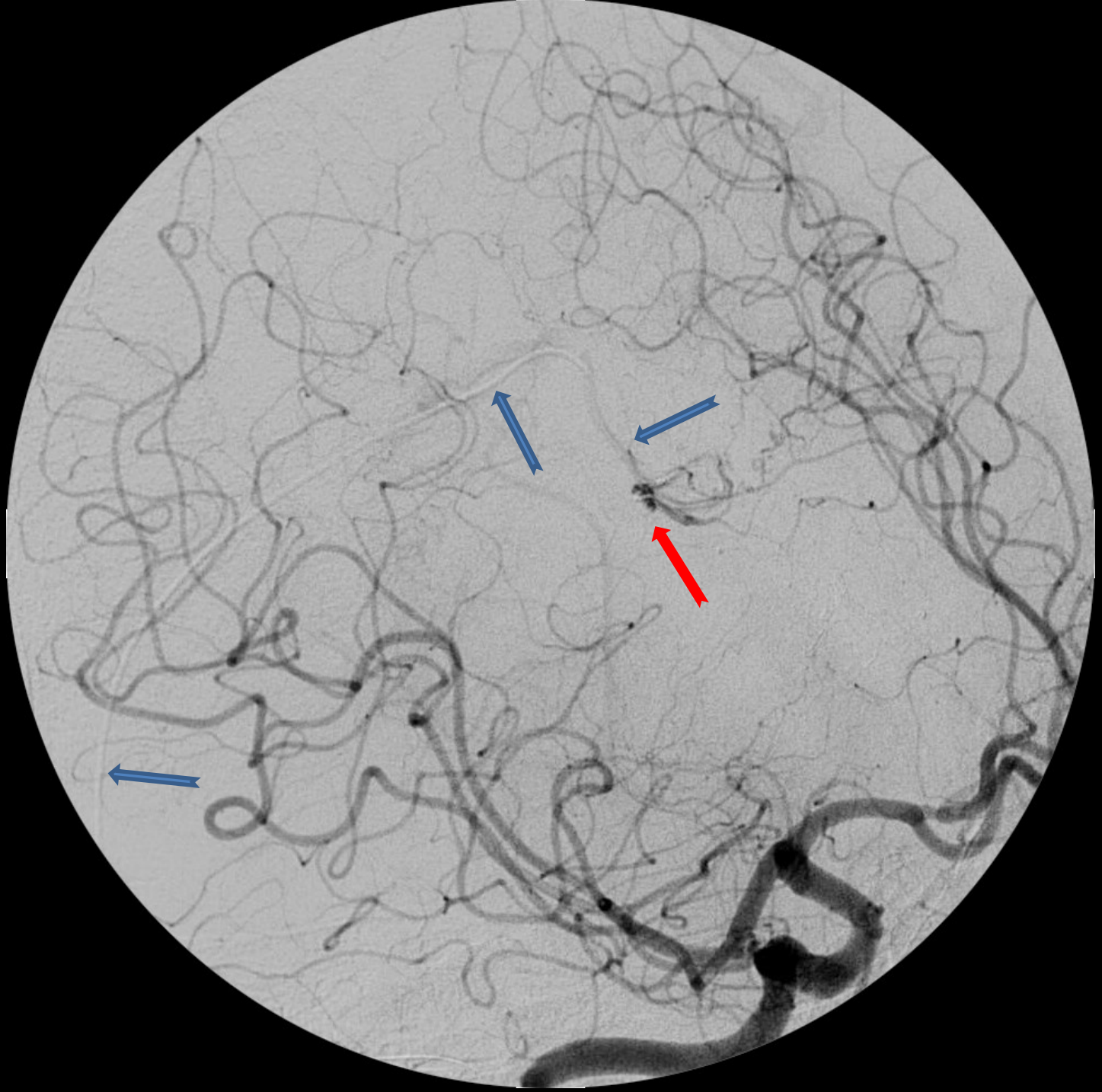
Post-operative control DSA.


Post-op. AP projection





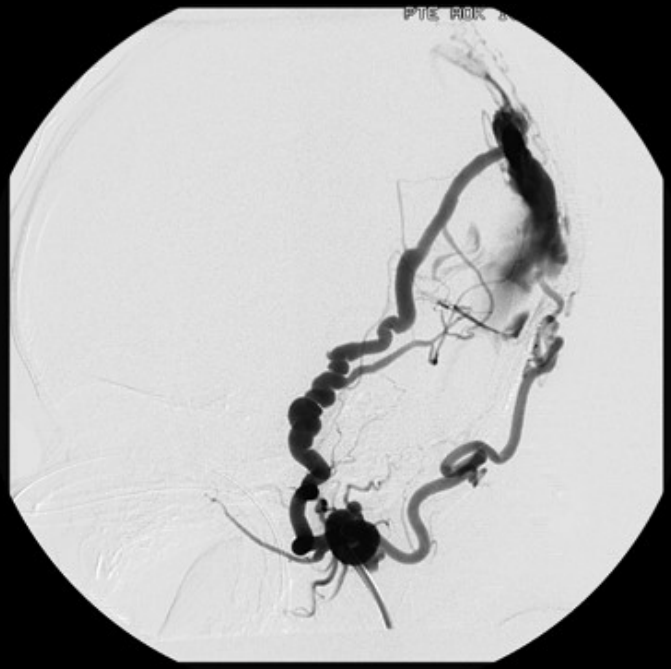


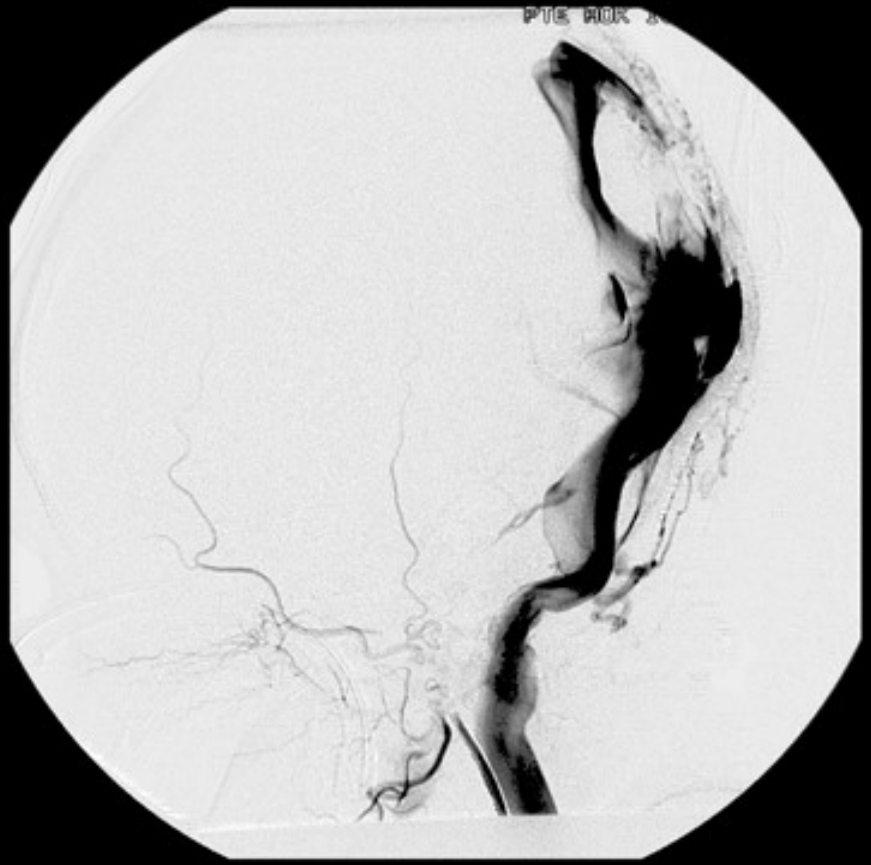


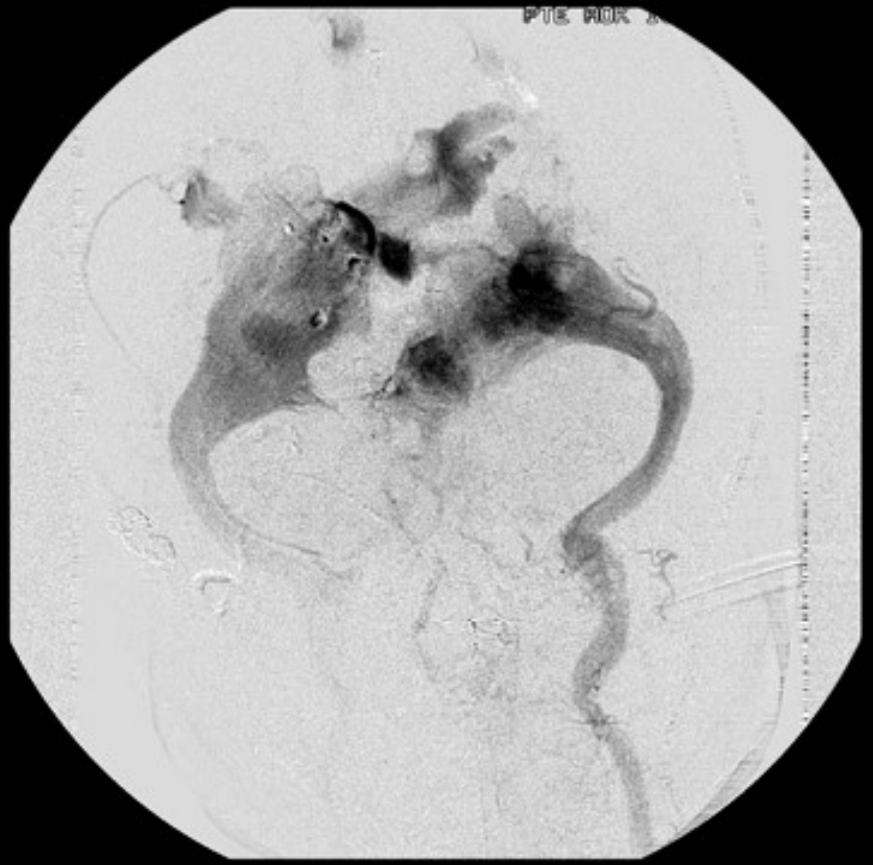
Dural fistula

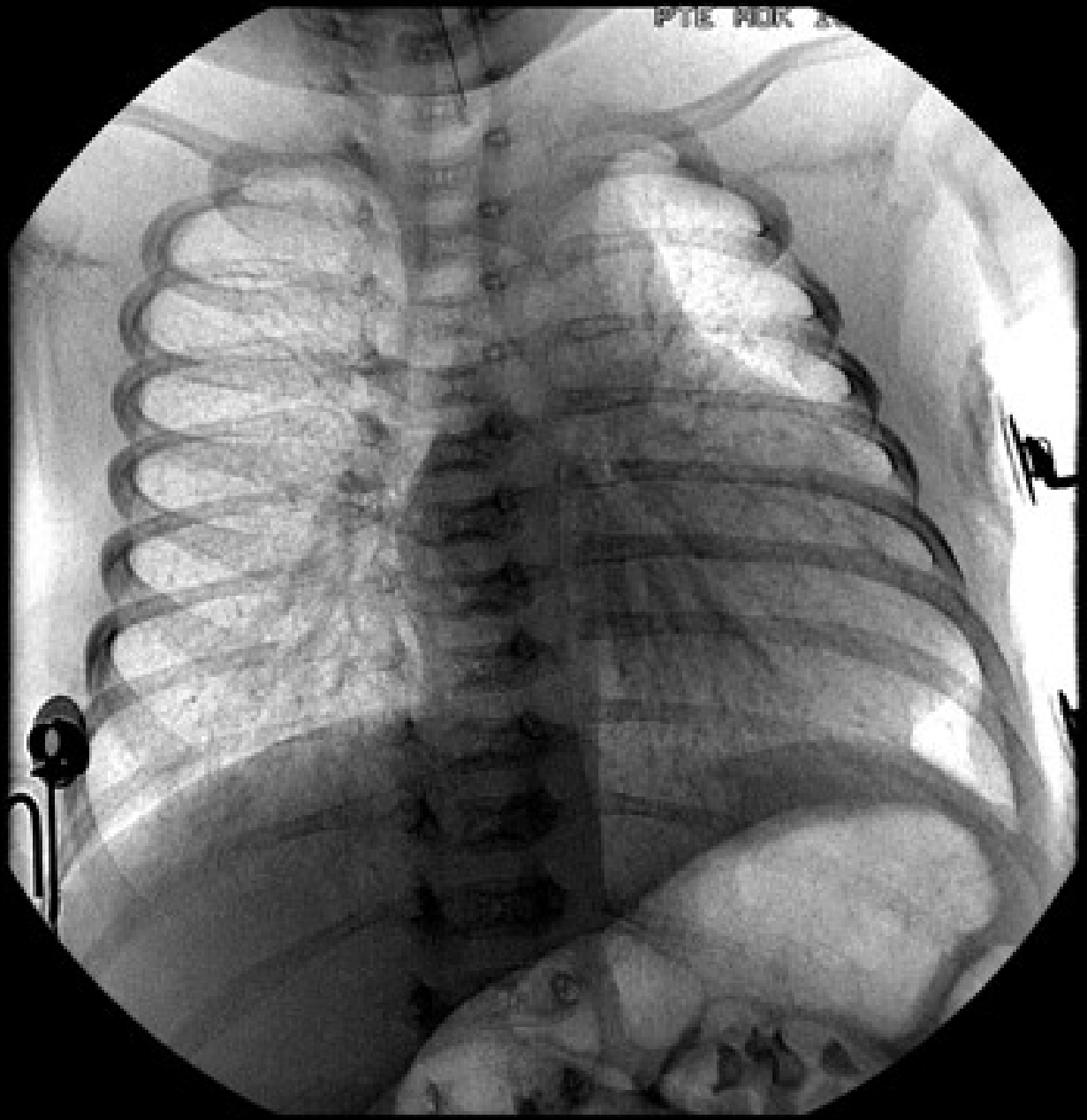

PHILIPS

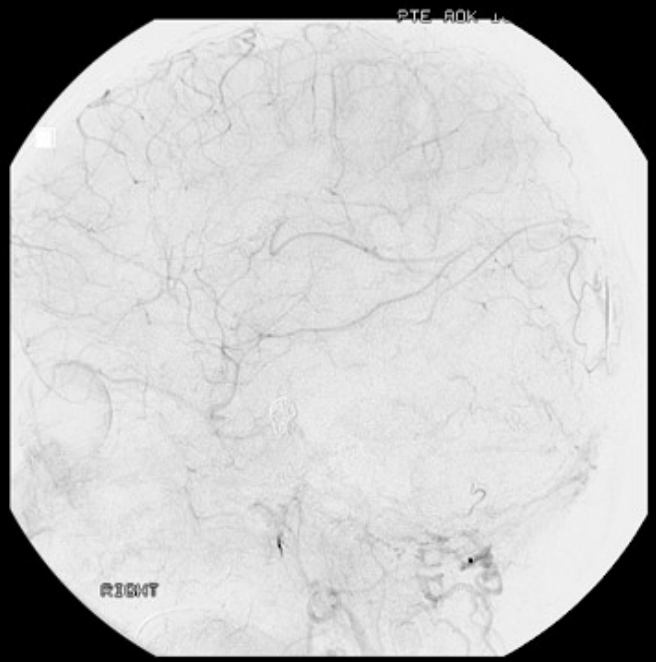


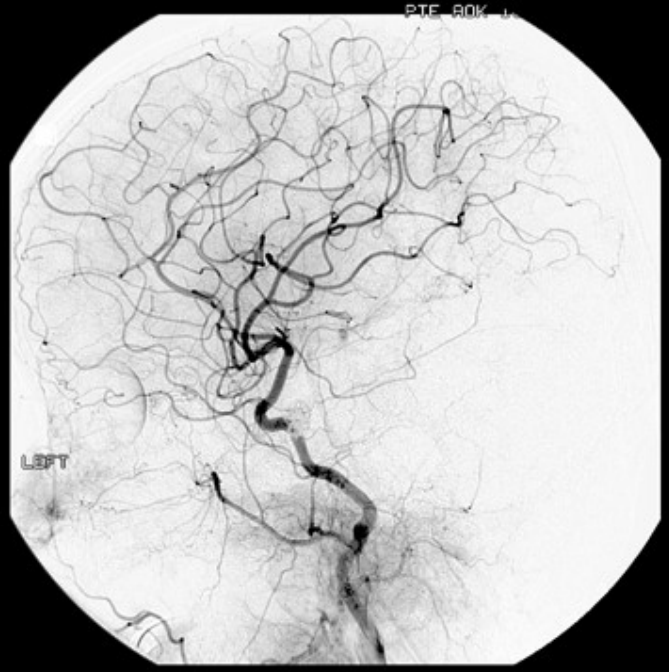







RIGHT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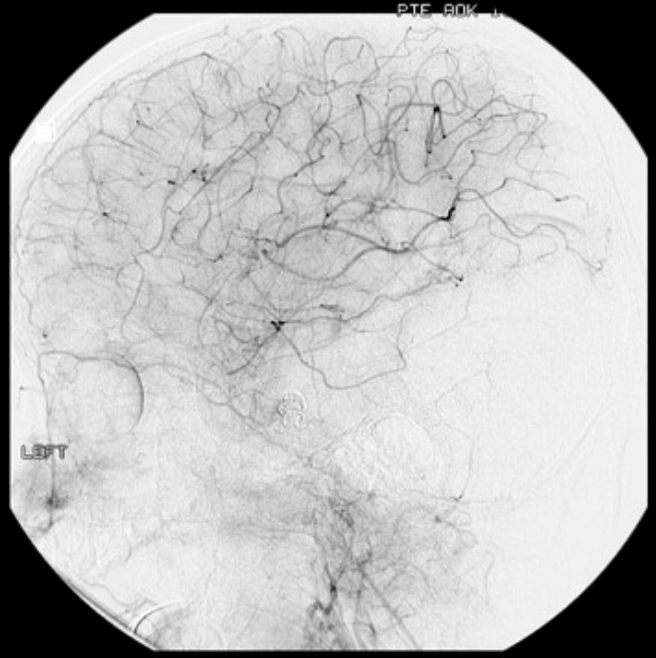
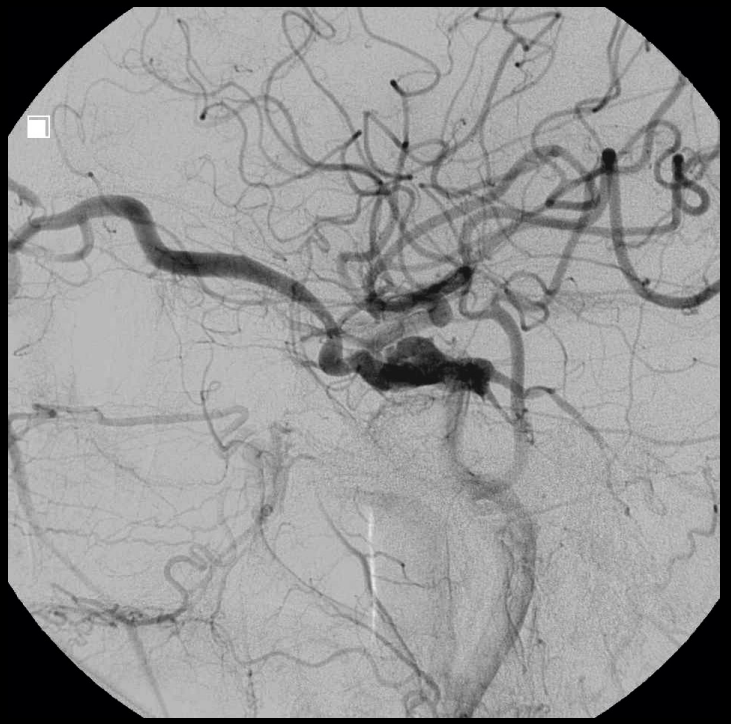
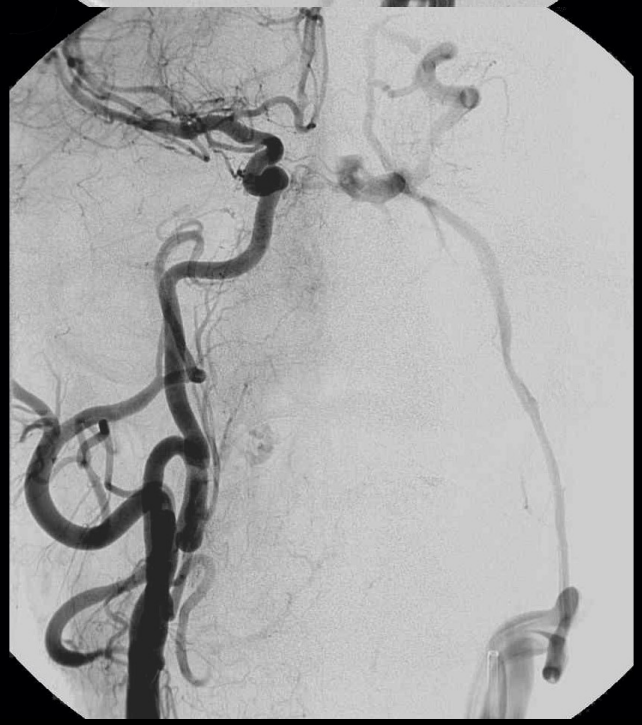
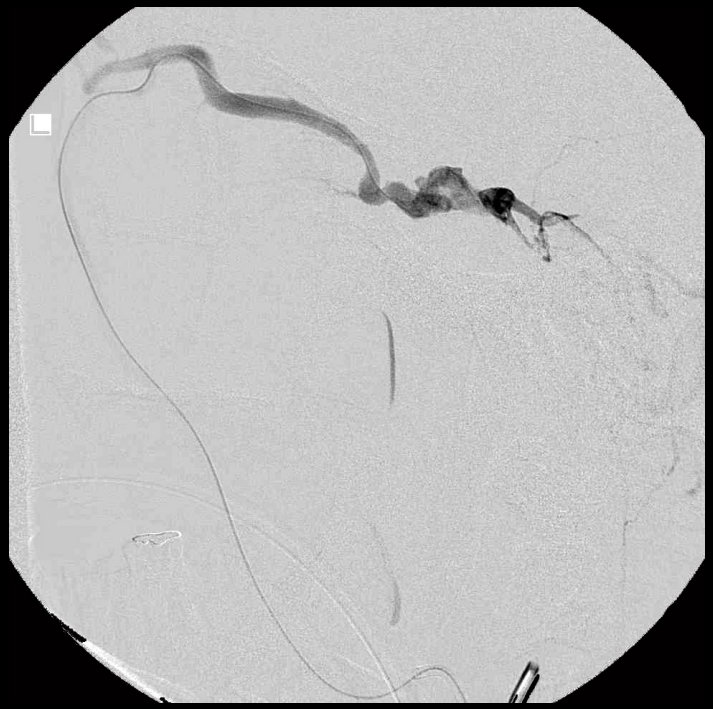
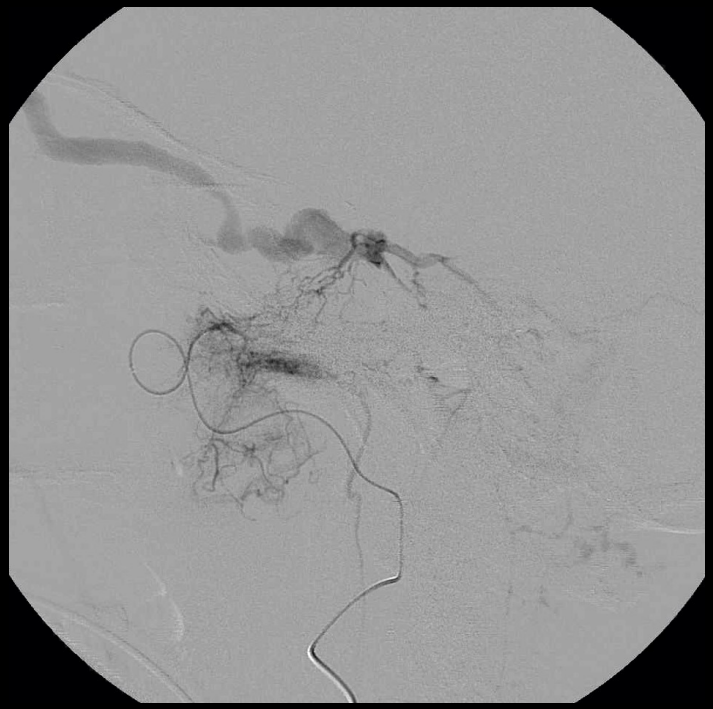

LEFT


PHILIPS
300
600
900
1200
1500


2014 12 24

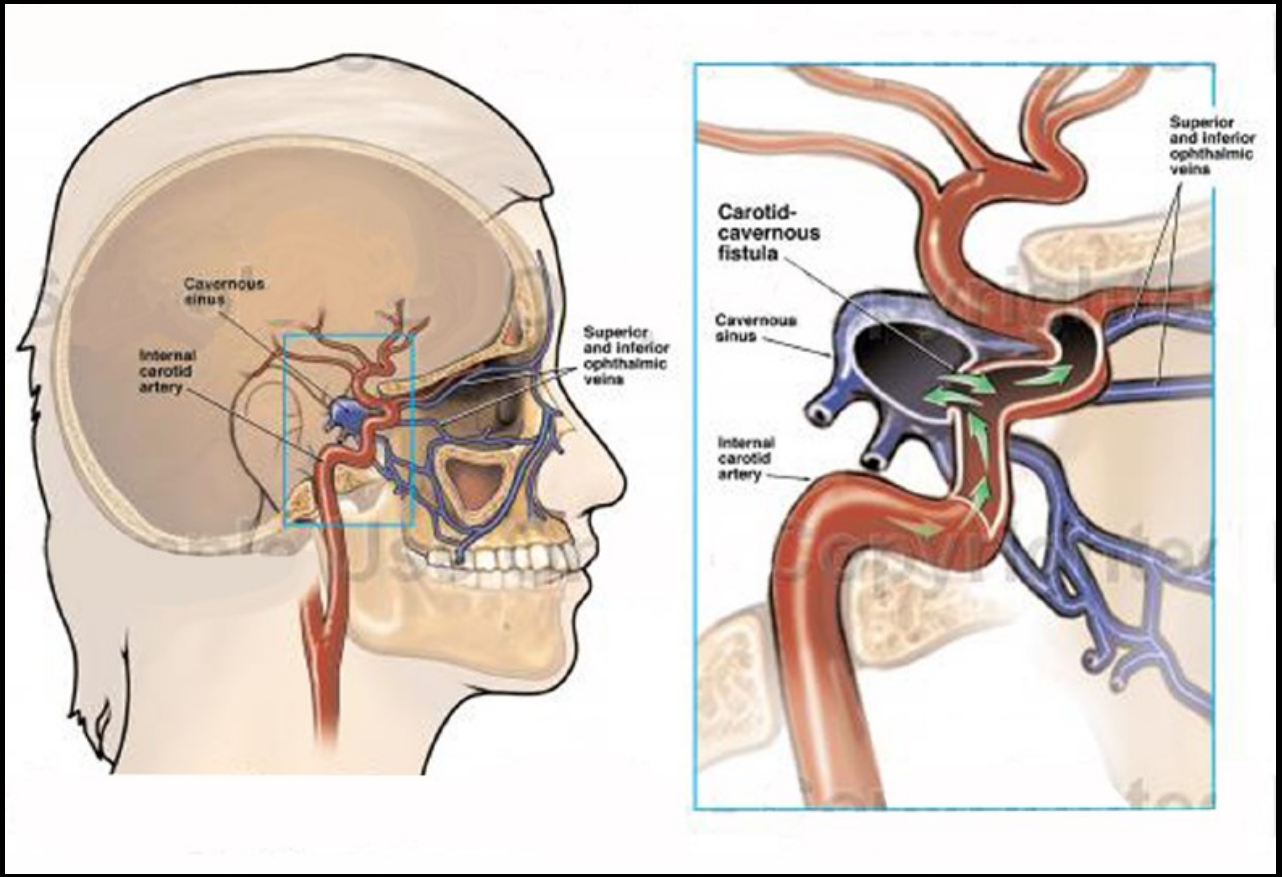


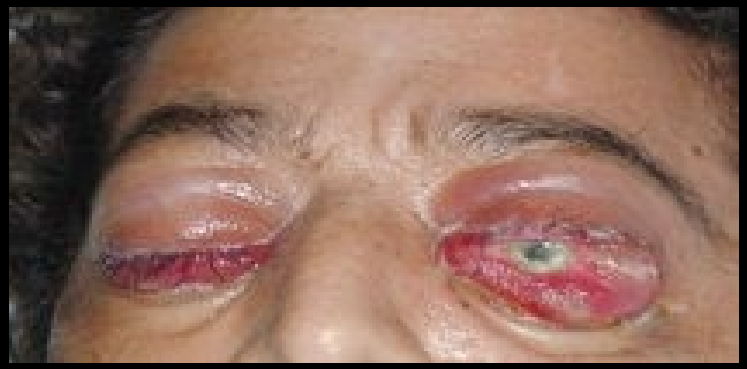

Intraorbital-retrobulbar dural malformation associated with aneurysm.

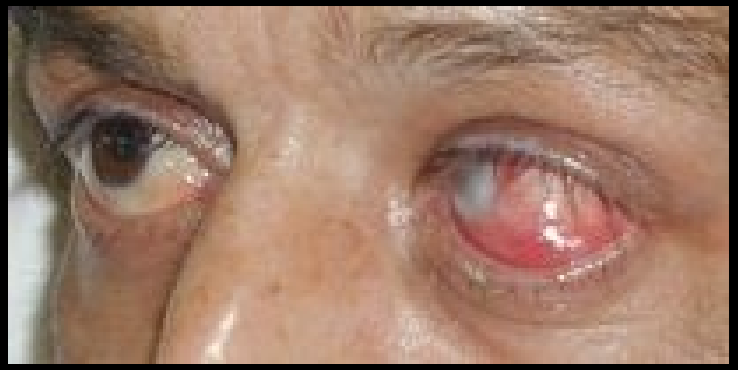
Feeders from the ophtalmic artery (a. ethmoidal).

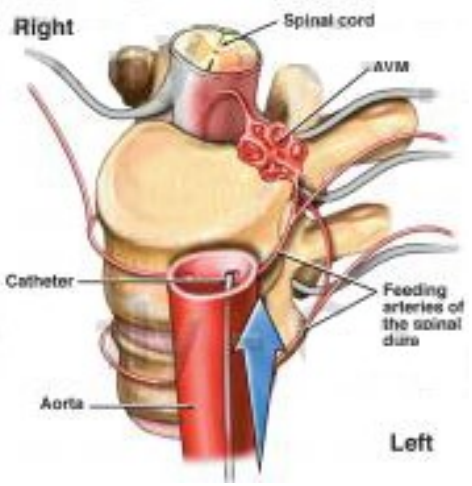
Only transvenous embolisation is possible through the superior ophtalmic vein.

Carotideo-Cavernosus Fistula

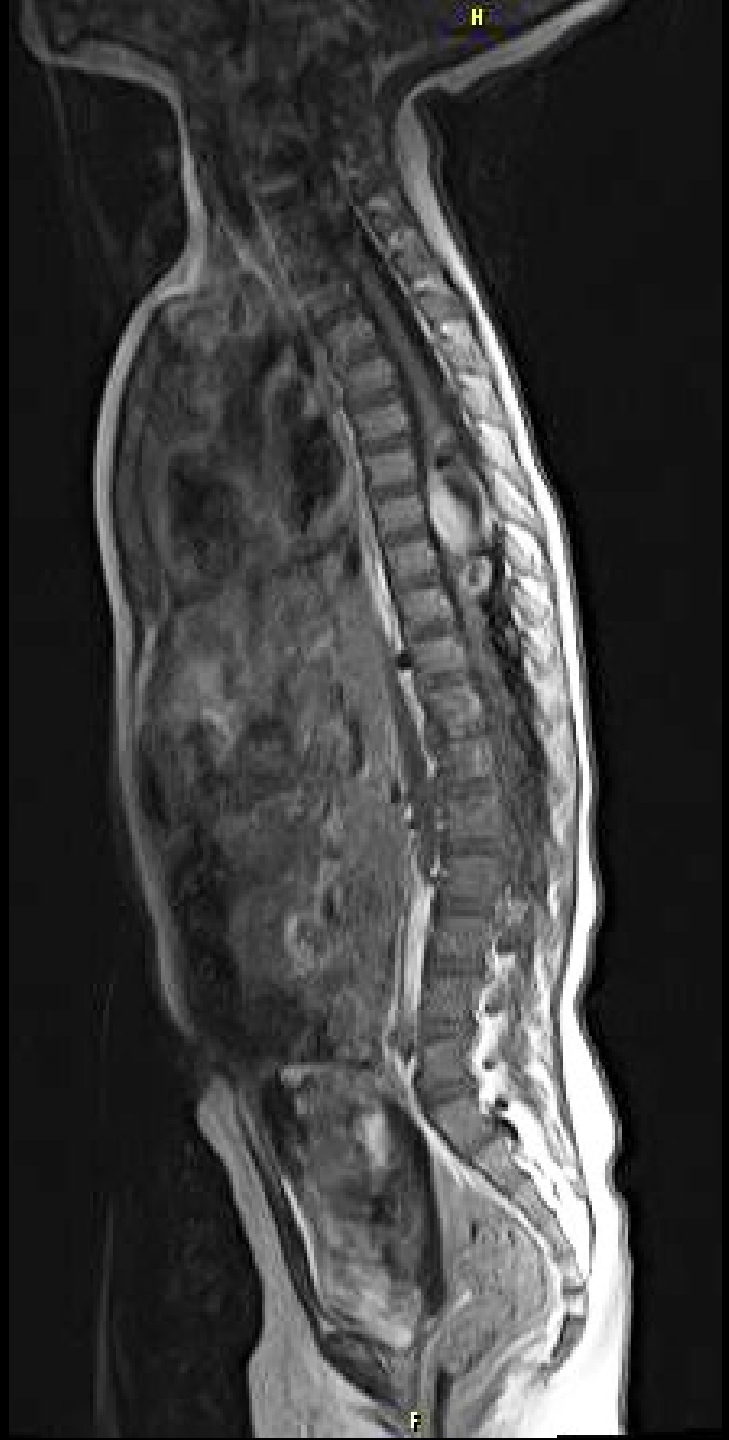

Cavernous sinus
Internal carotid artery
Superior and inferior ophthalmic veins
Carotid-cavernous fistula
Cavernous sinus
Internal carotid artery
Superior and inferior ophthalmic veins



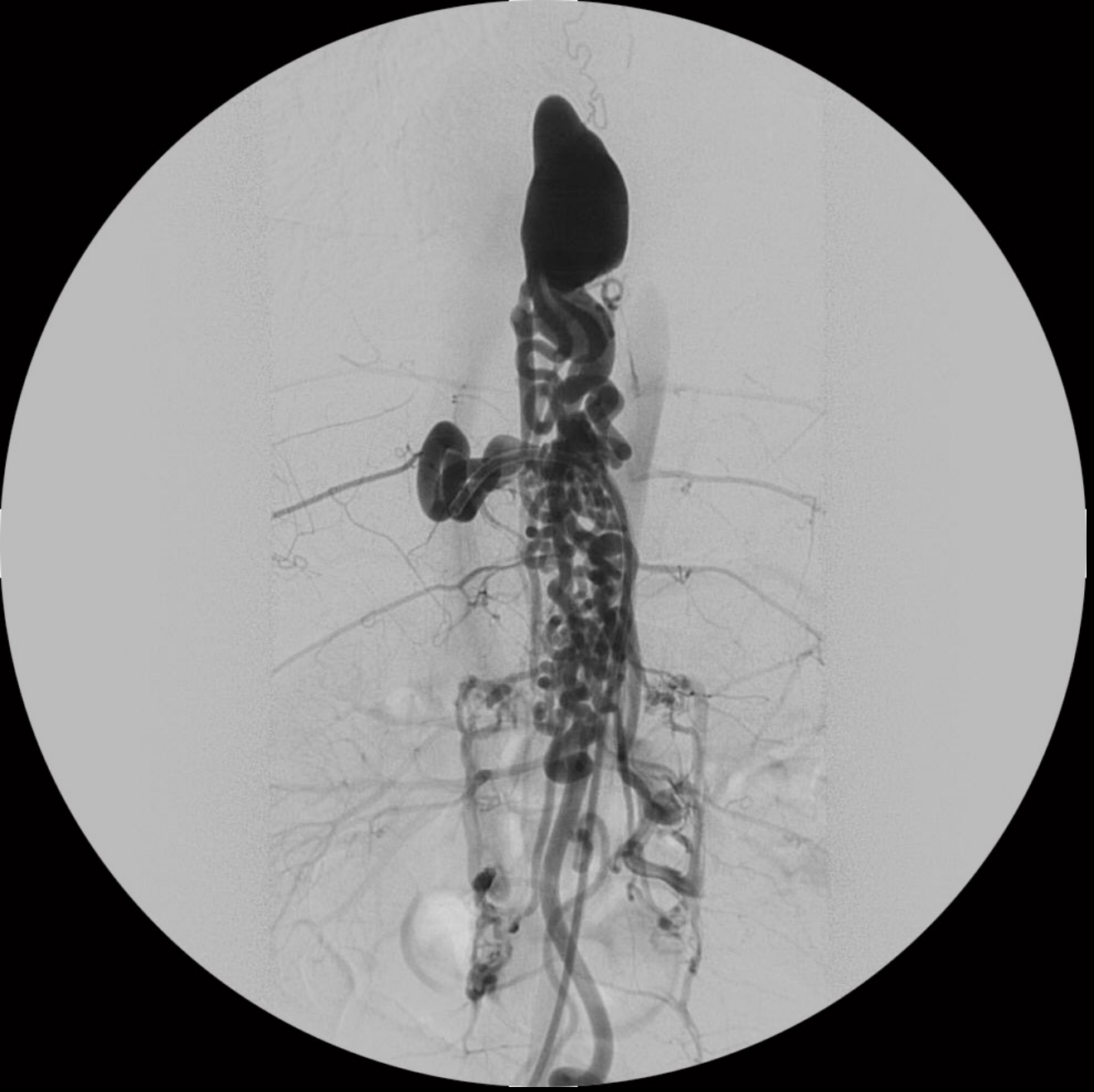




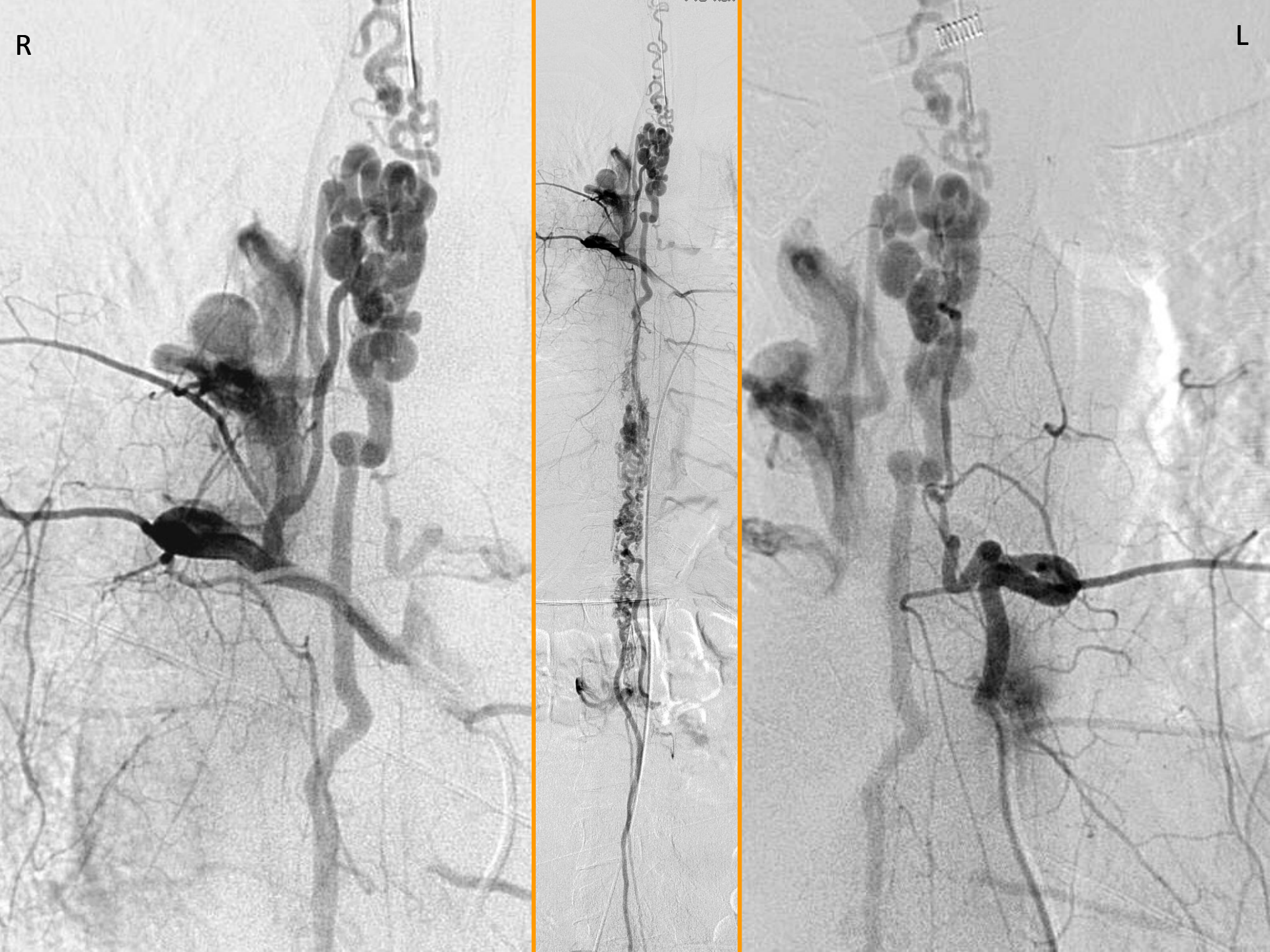
Spinal malformation


H
F

H
F




PTE AOK

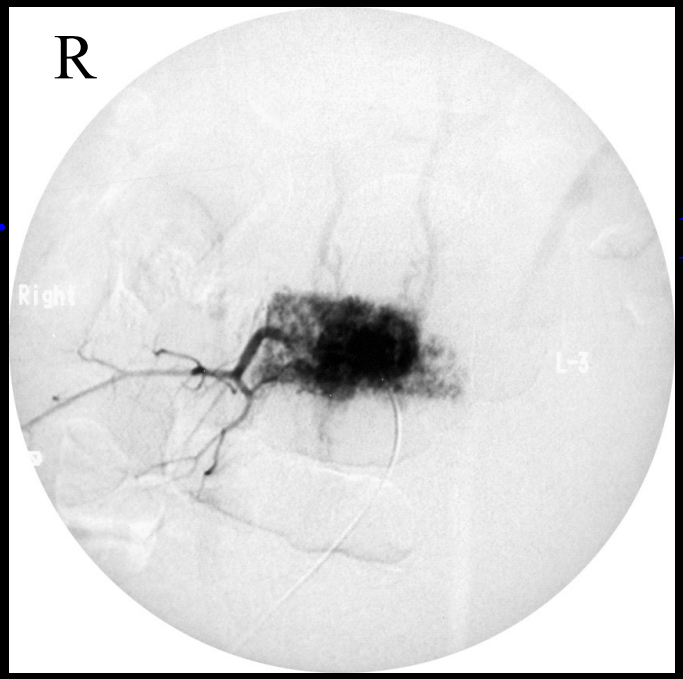

R
L

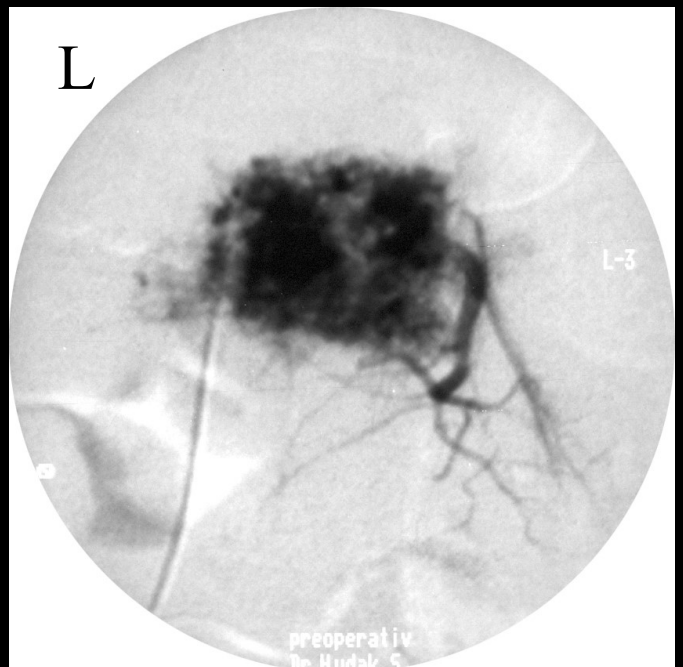

R

Haemangioma

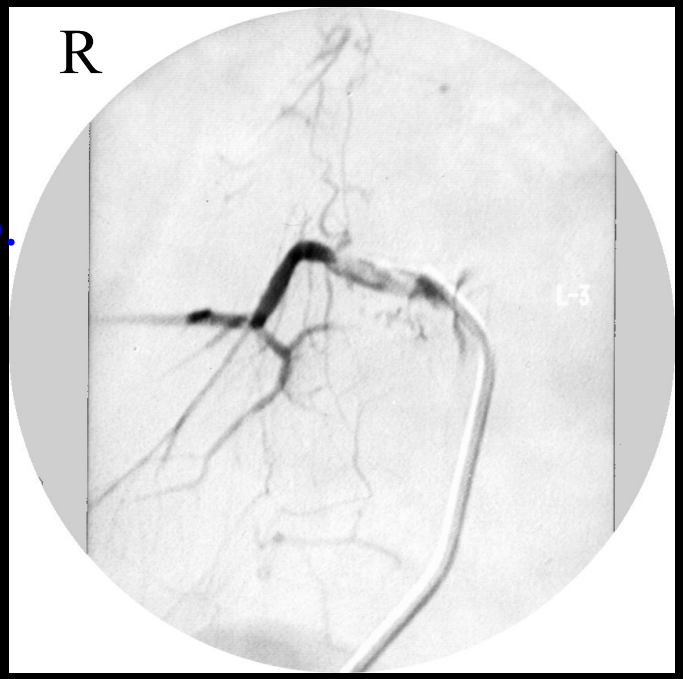
vertebral haemangioma

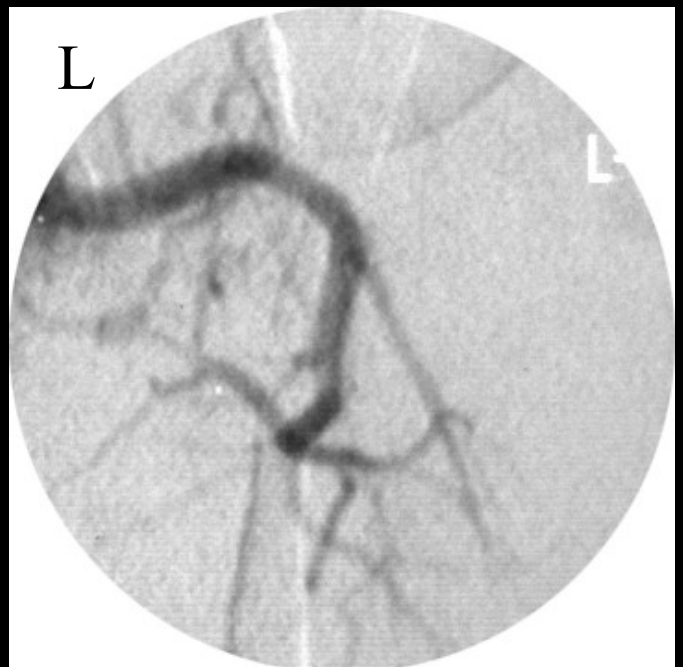
preop.



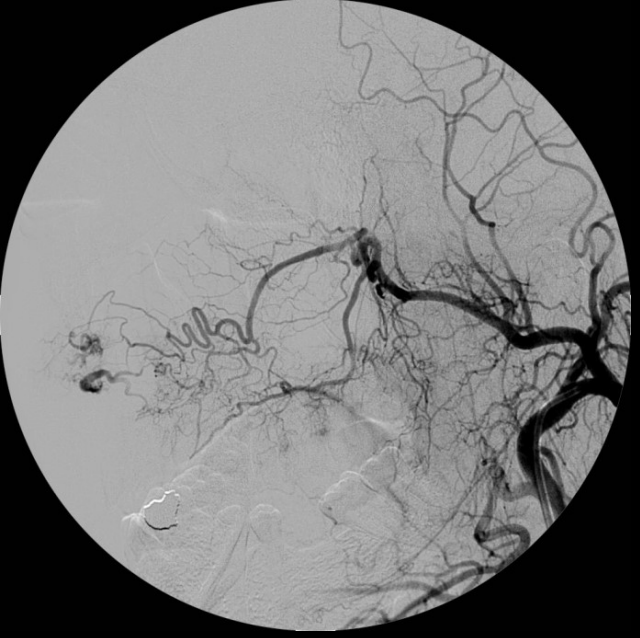


postop.



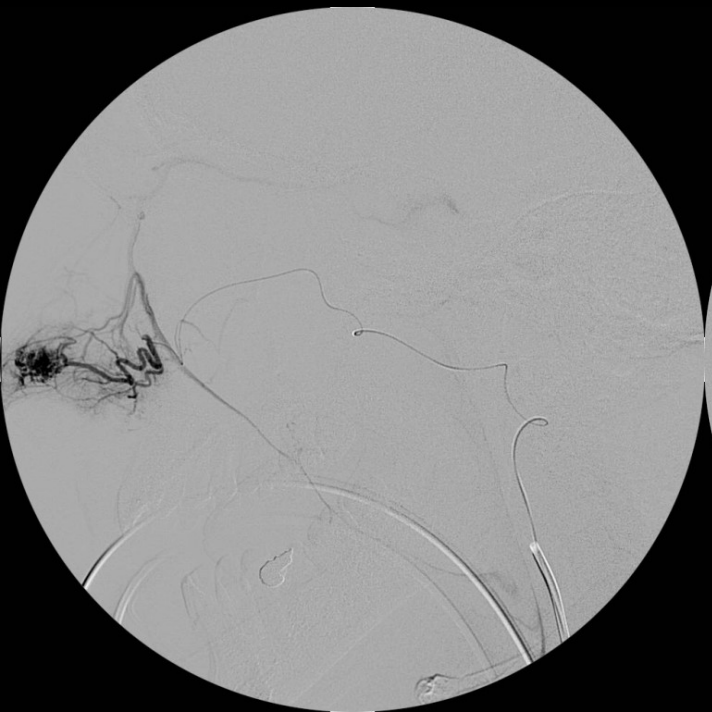


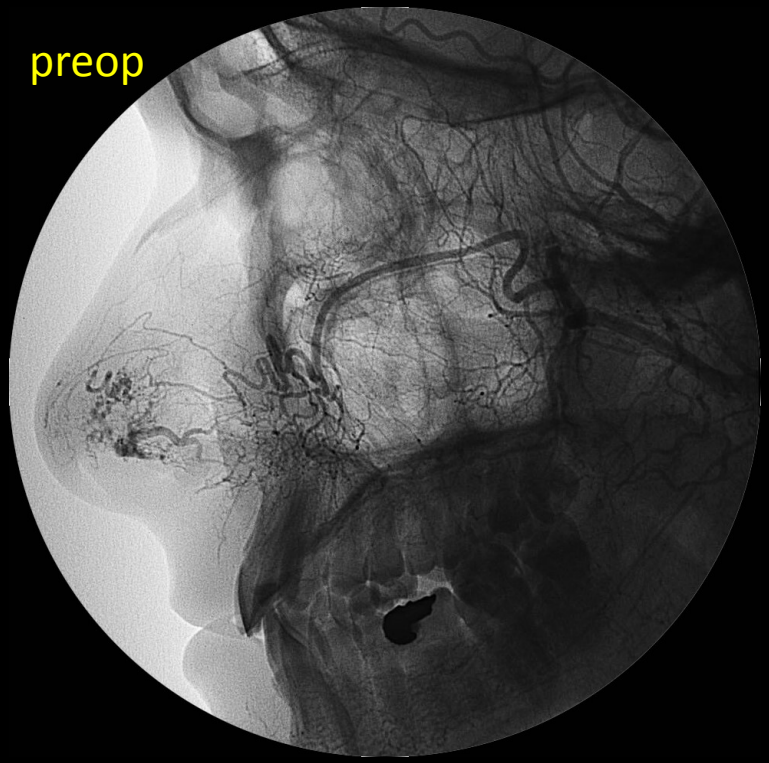
epistaxis

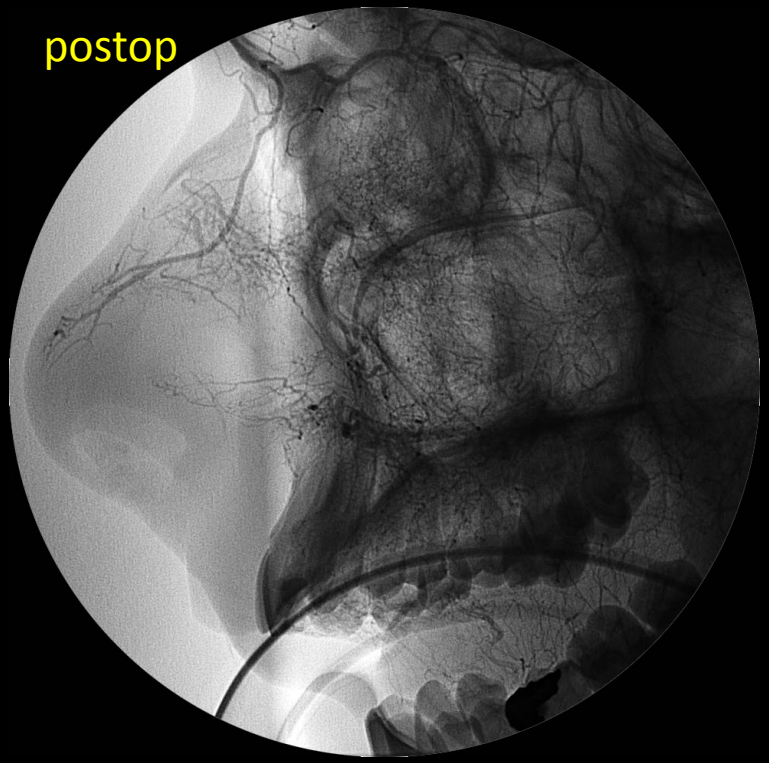


37 y.

angioma .

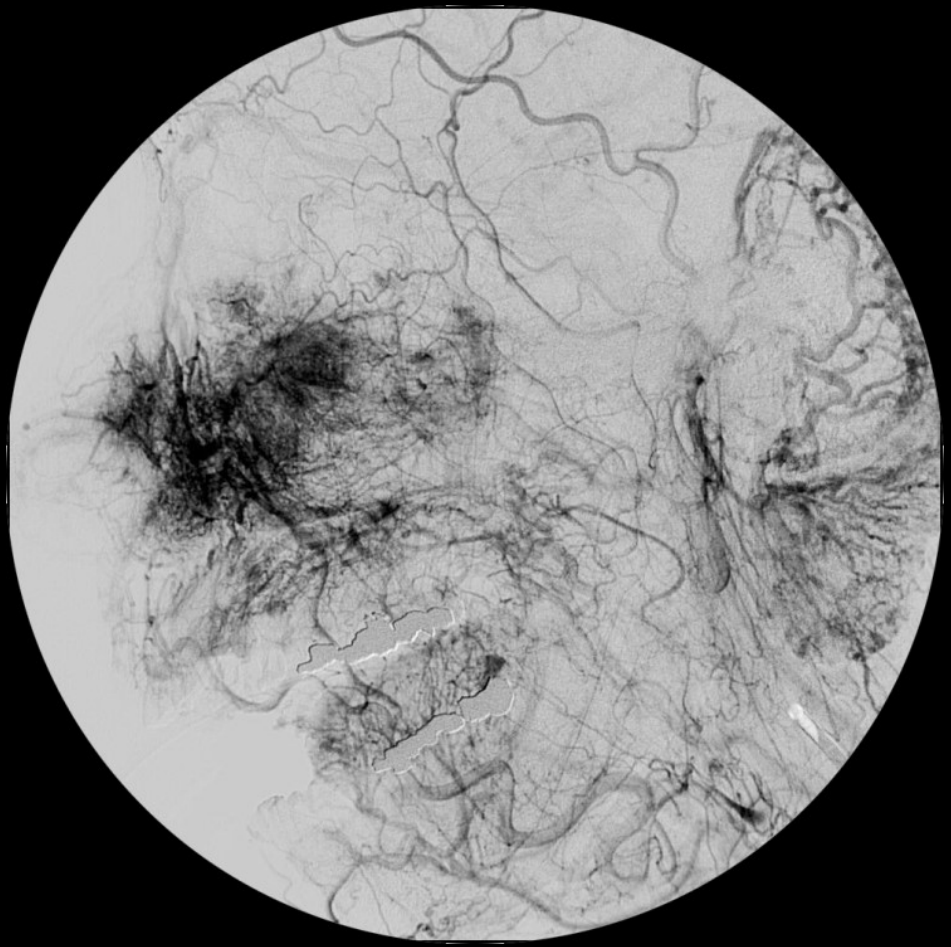


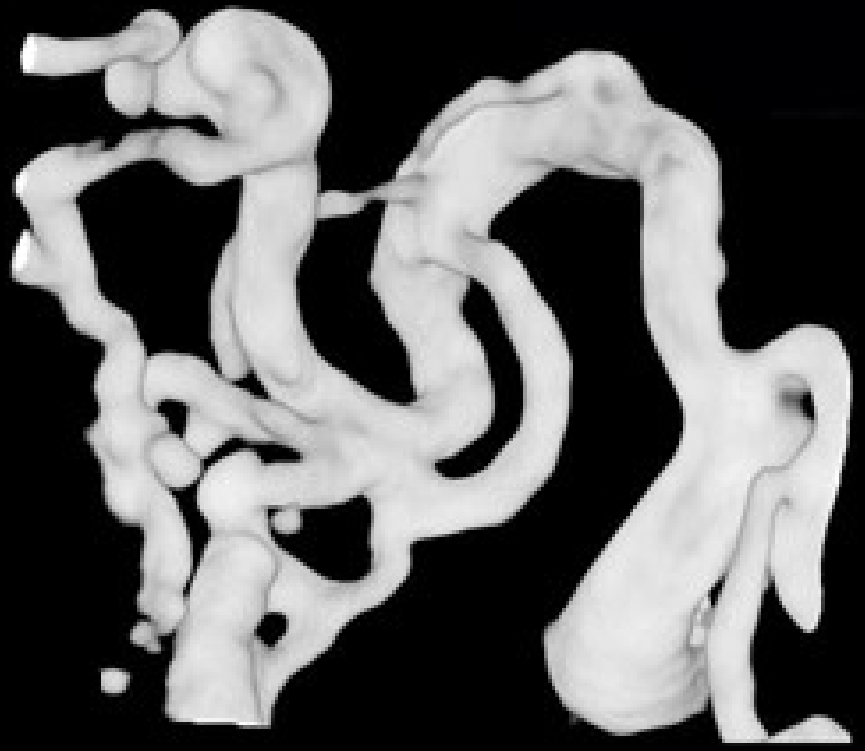


preop

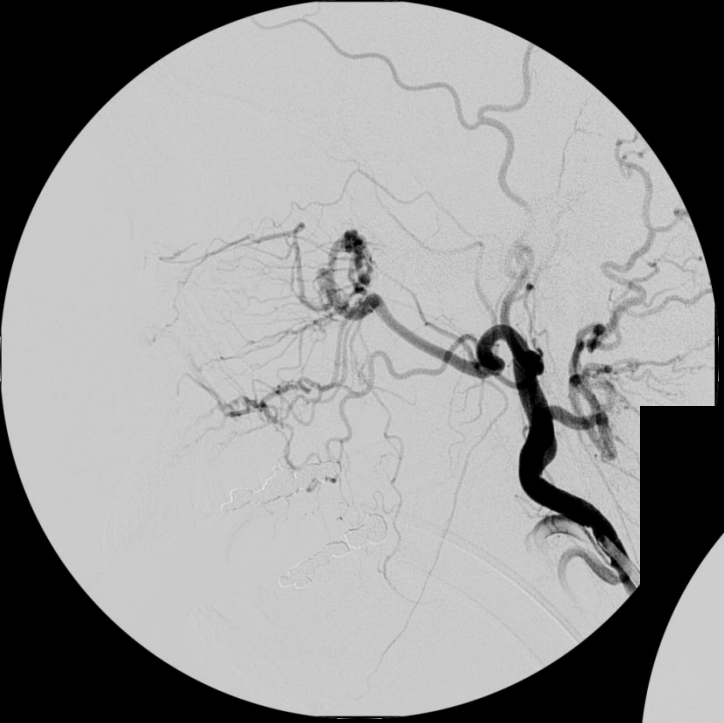
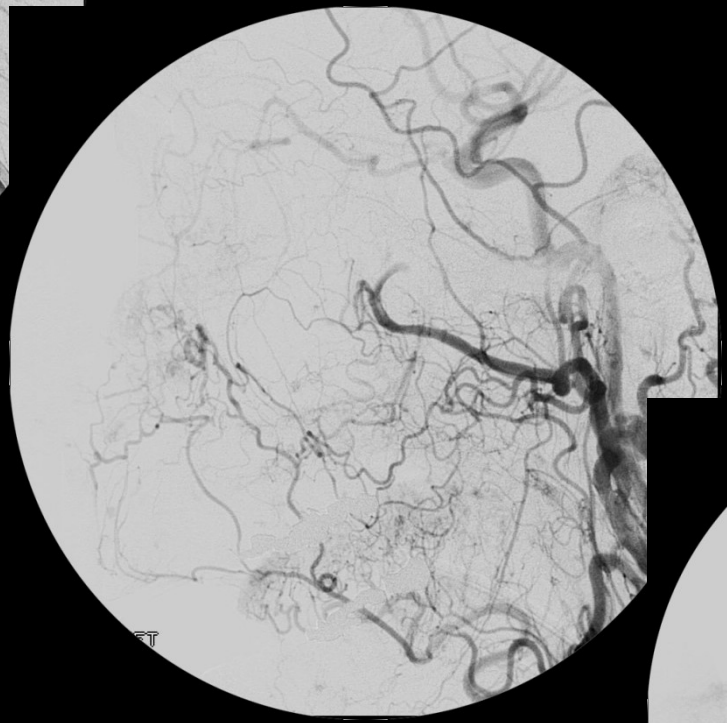
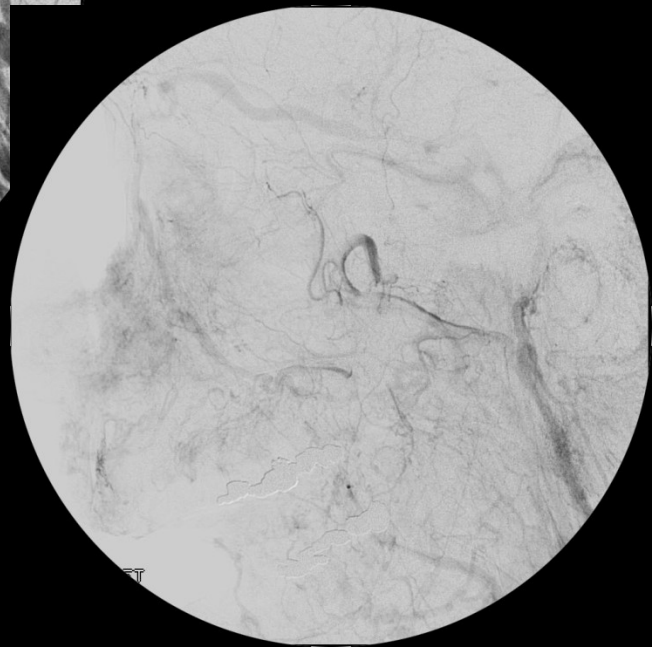

postop

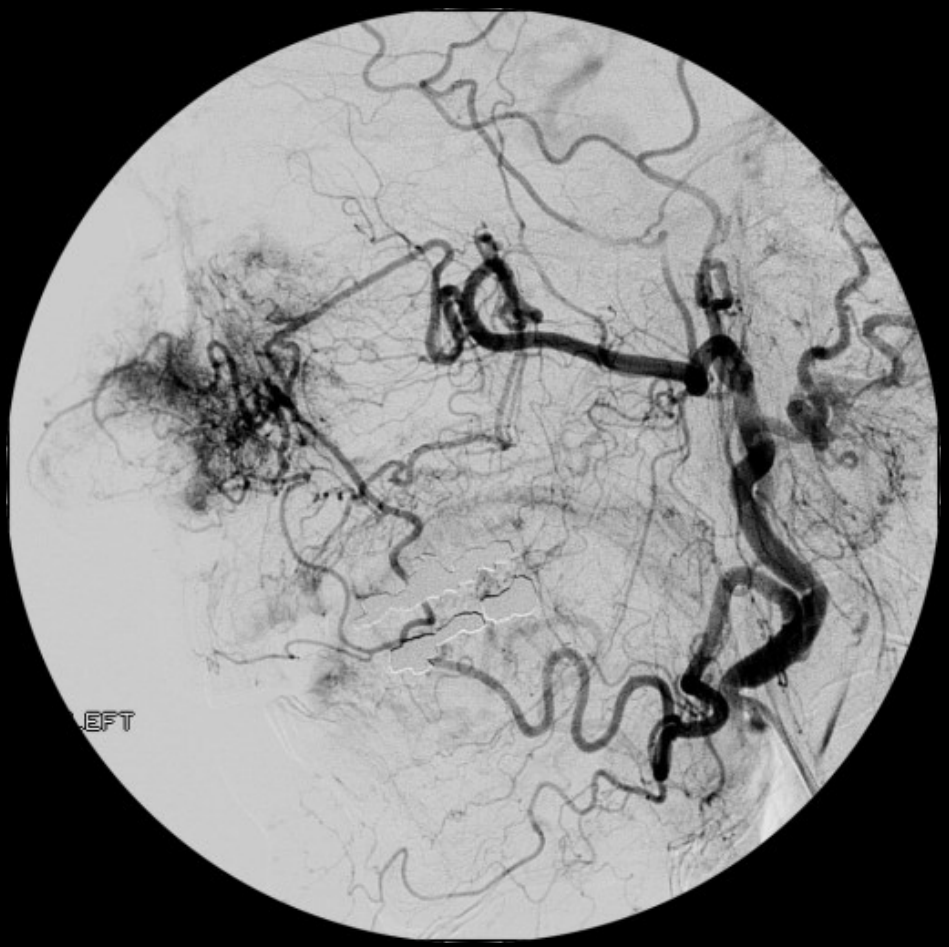

postop

Osler





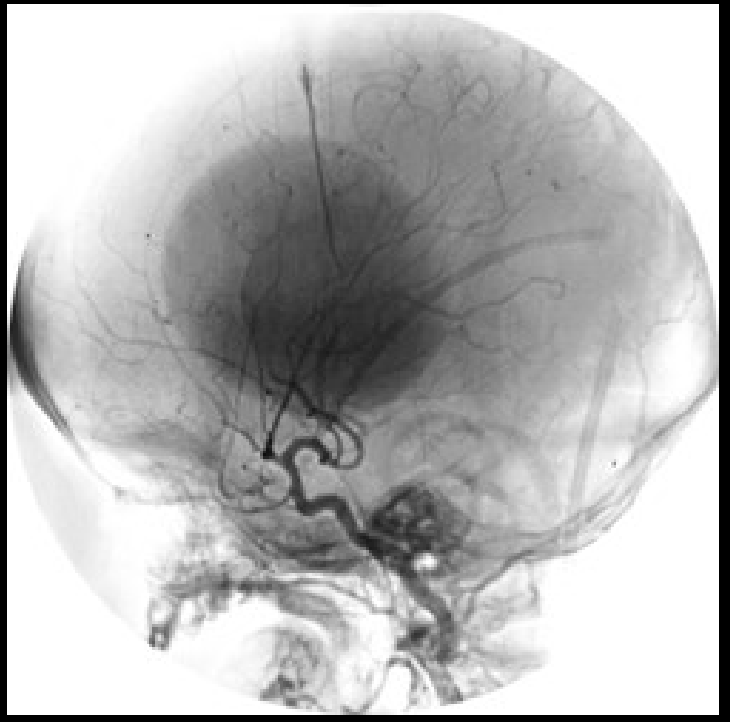

EFT

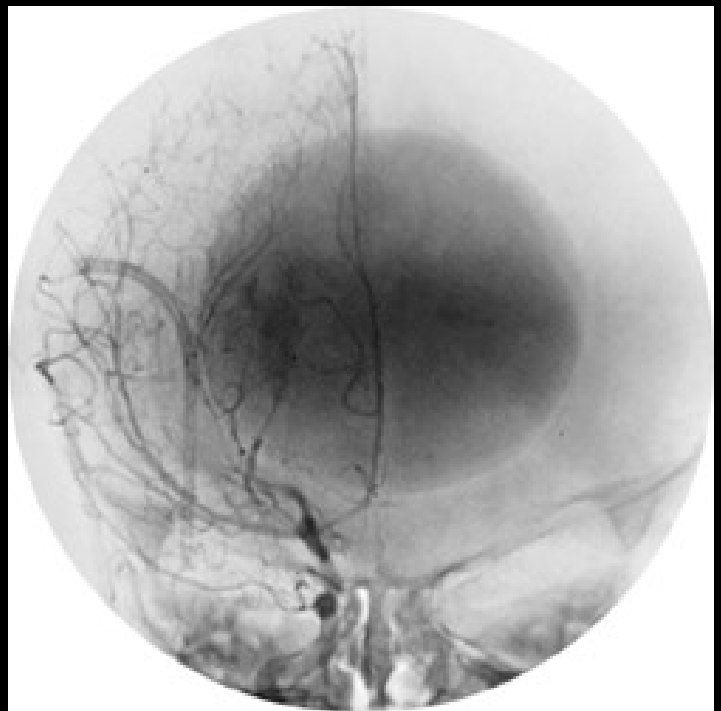

left


left

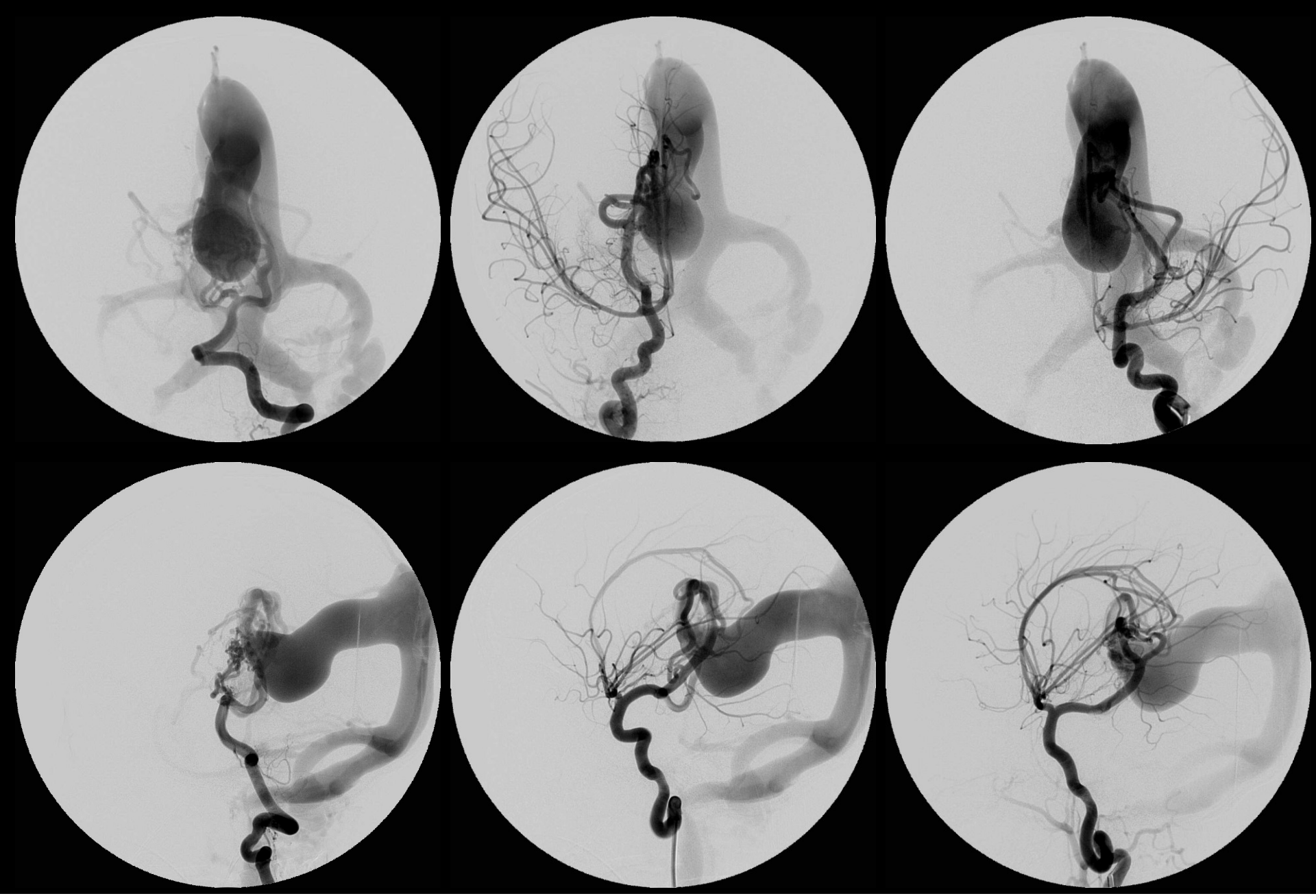

Galena malformation

1988

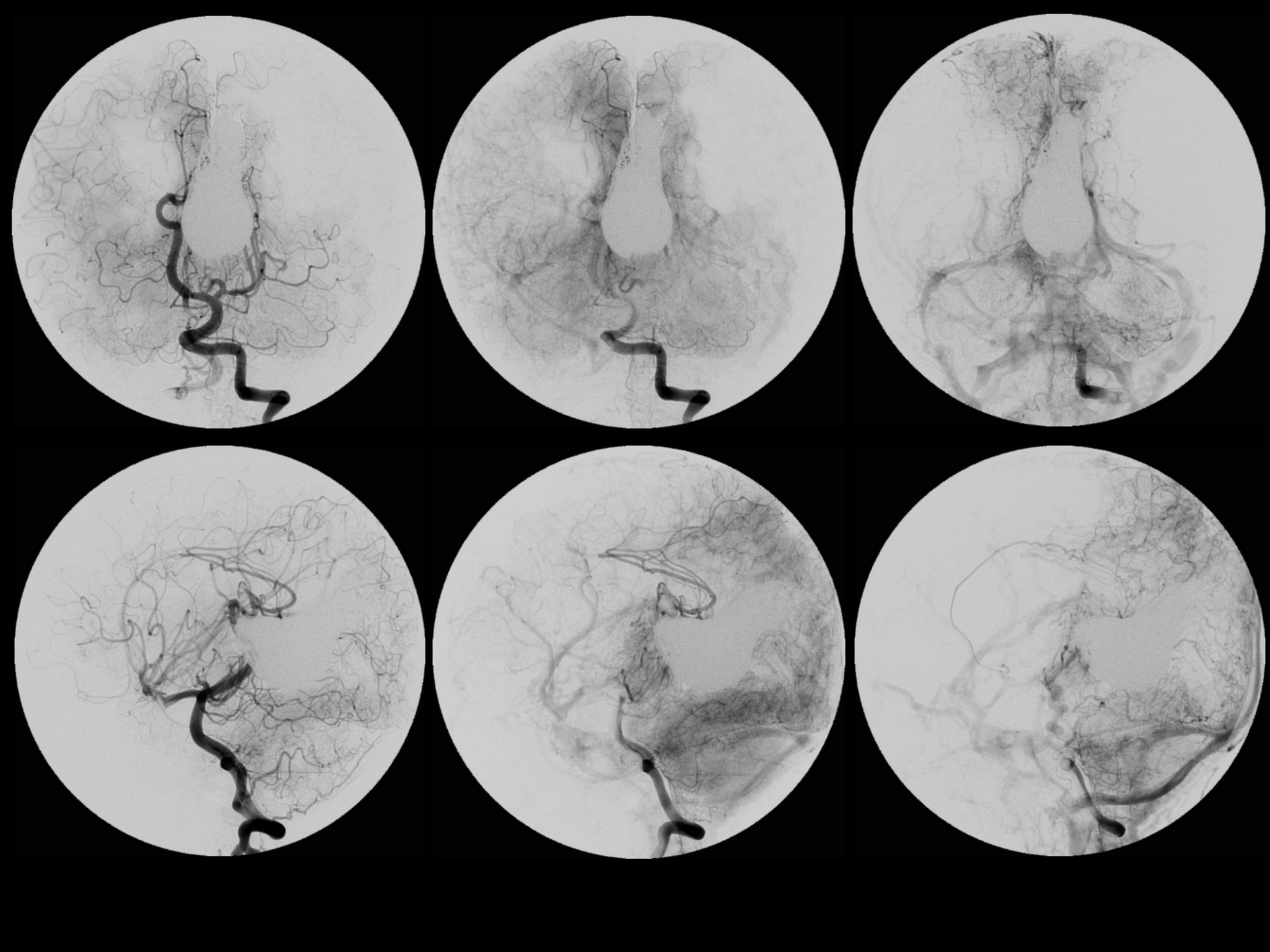




2 months old girl
developmental retardation
hydrocephalus
cerebral atrophy
cardiac hypertrophy
pulmonar hypertension



2 hónapos lány, fejlődési elmaradás, hydrocephalus
Agyi atrophia, sziv hipertróphia, pulmonális hipertenzió

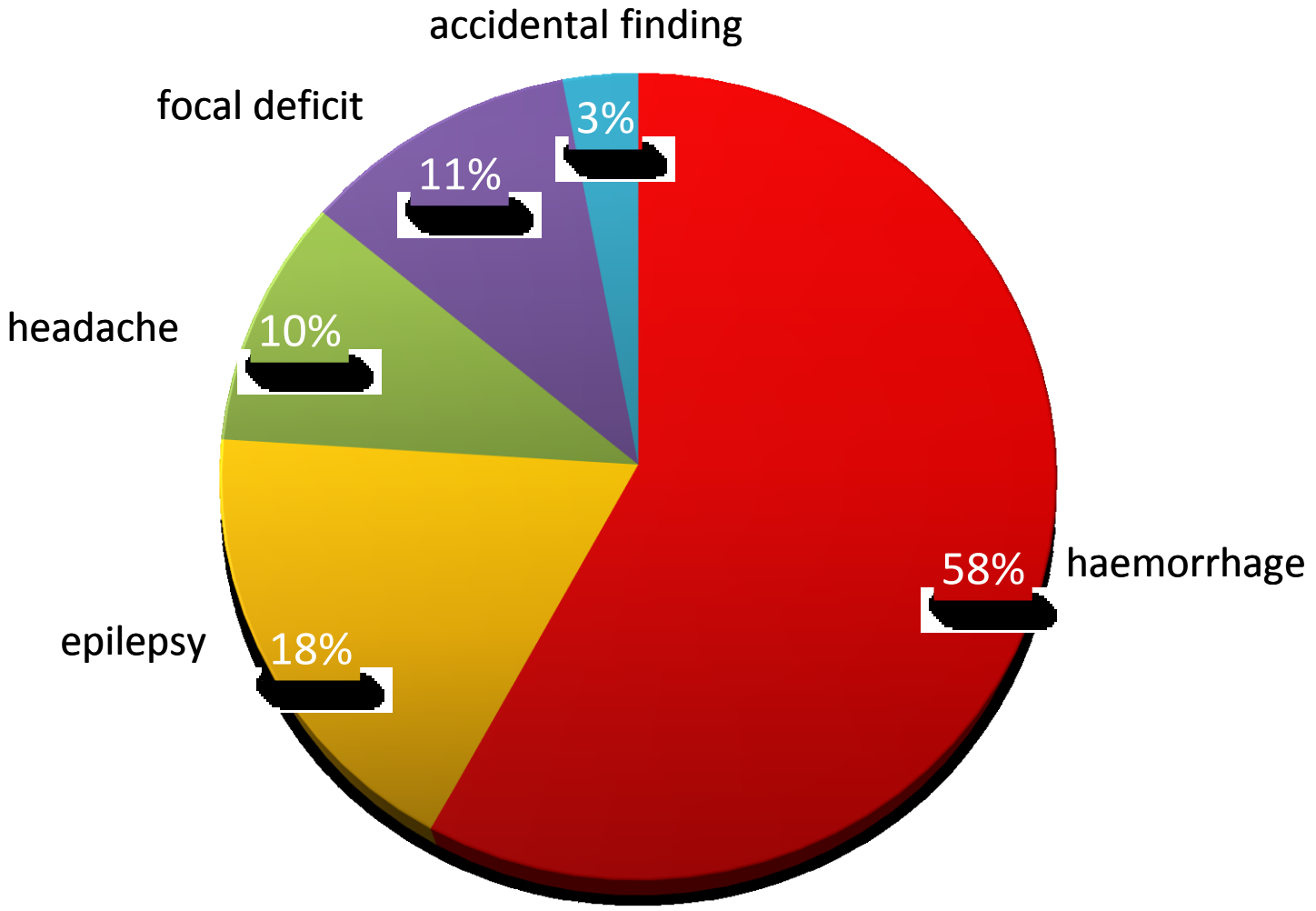


I am going to present the results of the first 100 consecutive patients with a minimum of 1.5 years follow up treated by means of CAVA between 2003-2012.

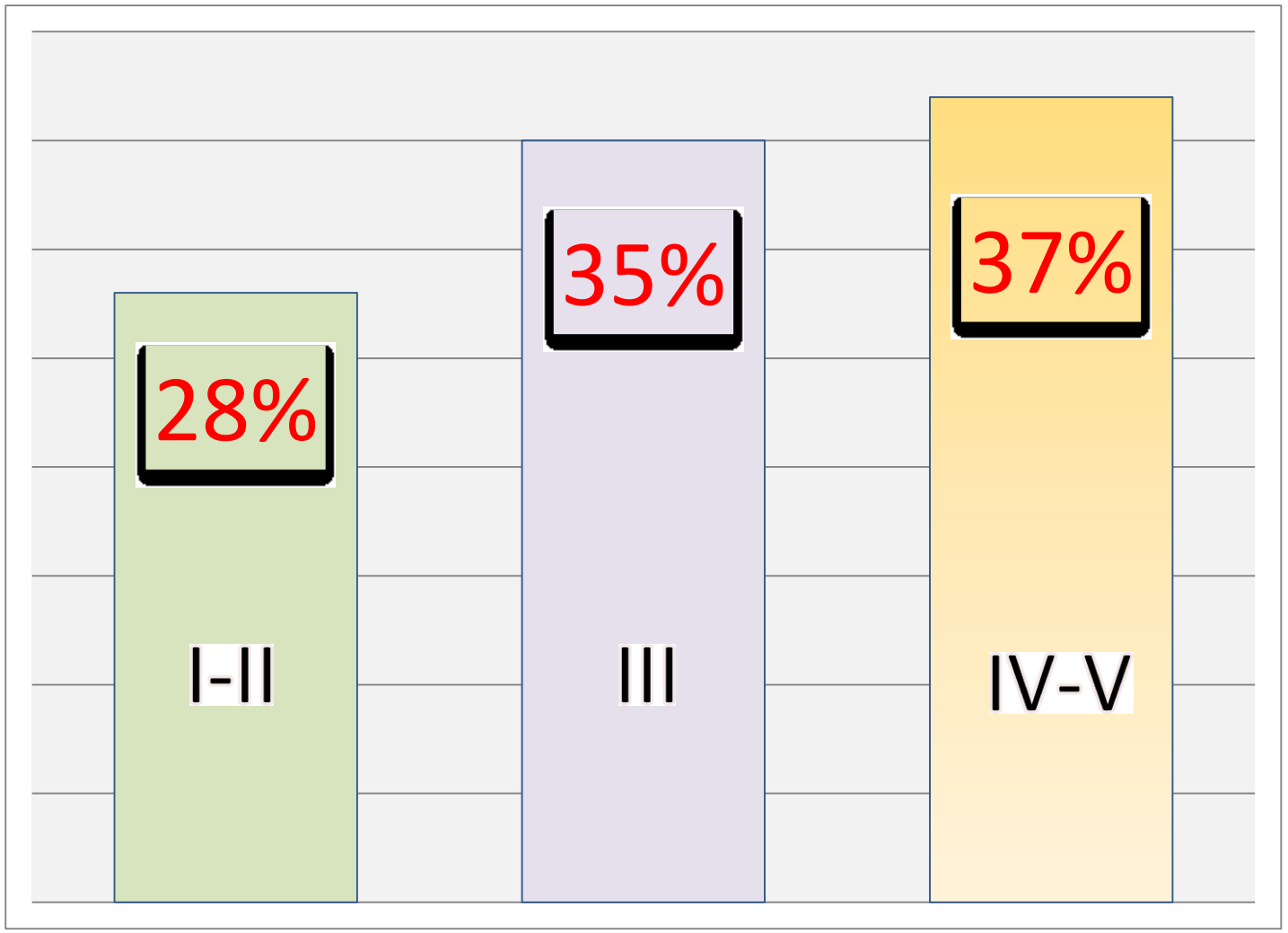
Number of operation 220
(≈ 2 operations / patients)

We have continued with CAVA since then.

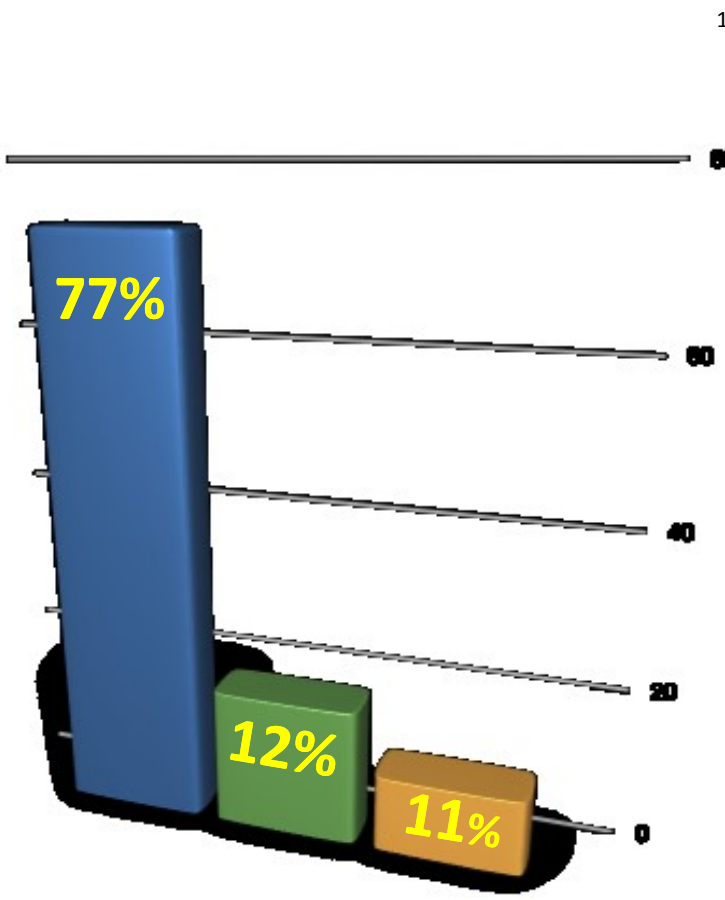
Indication


accidental finding
3%
focal deficit
11%
headache
10%
epilepsy
18%
58%
haemorrhage

Spetzler - Martin grade



Intracranial AVM-CAVA result with 10 year follow-up 2003-2012 (100 pts)



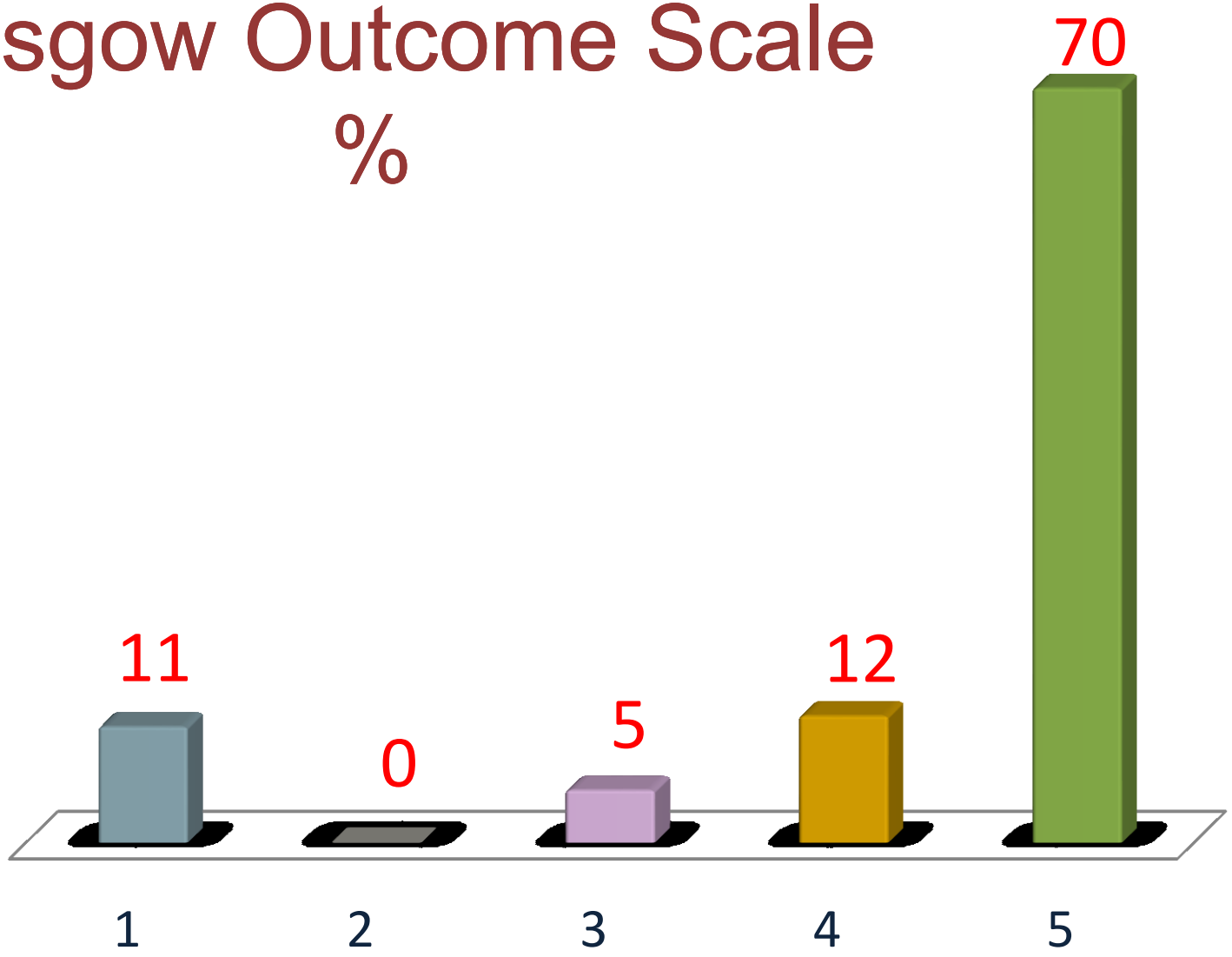
77 patients complete occlusion,

12 pts. more than 90-80 % occlusion,

11 pts. > 60 % occlusion

Glasgow Outcome Scale

%



2 pts lost to follow-up

Konklúzió

- Csak a véna elzárása növeli a vérzés
- A CAVA behatolás lehetővé teszi a malformáció teljes.
- Csökken a szövődmények.
- Nem szükséges az összes tápláló artéria elzárása

Konklúzó

Nem szükséges az összes, eredetileg kórosnak látott ér elzárása, rezekálása, vagy besugárzása, mert képesek regenerálódni (normalizálódni)!