ICCA STROKE 2019

WIST

CT imaging training

Klaus Mathias

Hamburg / Germany

klausmathias@t-online.de

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DISCLOSURE STATEMENT OF FINANCIAL INTEREST

Within the past 12 months, I have had a financial interest with the organizations listed below.

AFFILIATION/FINANCIAL RELATIONSHIP	COMPANY
• Consulting Fees/Honoraria	• Gore • Terumo

CT

ICCA STROKE 2019

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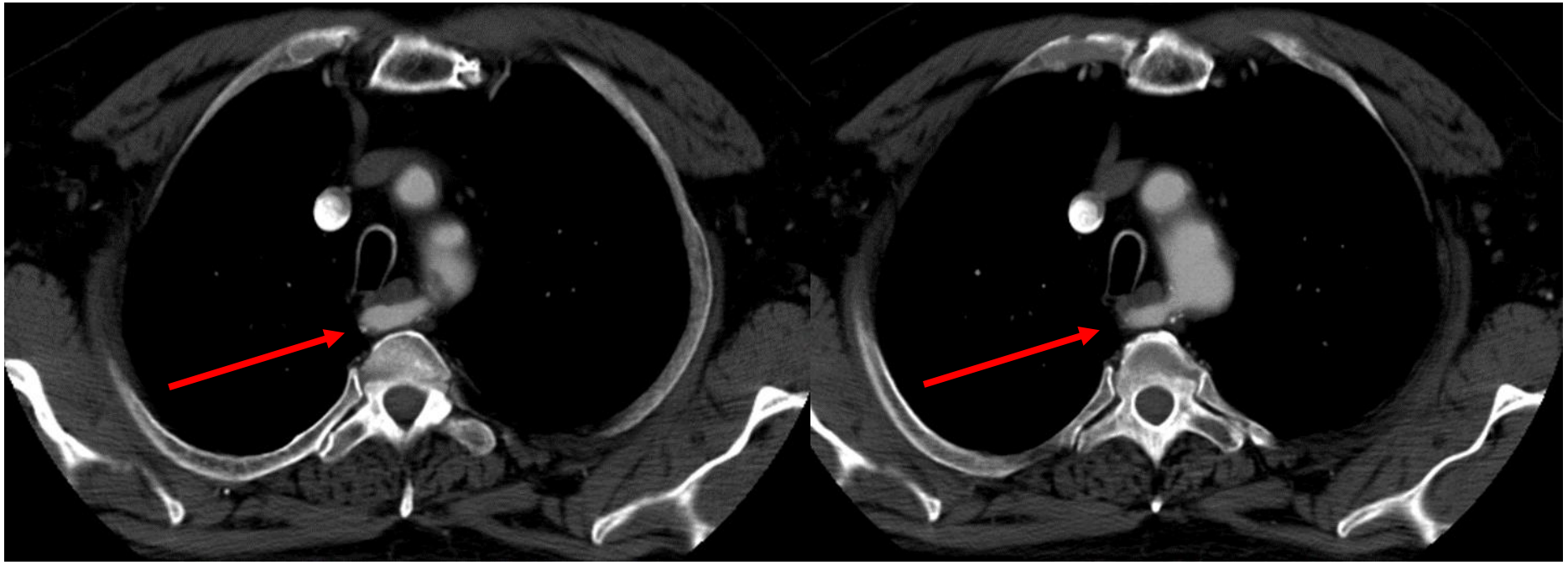
We need brain imaging in all supra-aortic interventions

Imaging includes native CT, CT angiography (CTA) and CT perfusion (CTP)

CT Questions

- Brain pathology
  - Acute infarction
  - Cerebral hemorrhage
  - Cerebral atrophy
  - Old infarctions …
- Condition of arteries (CTA)
  - Vascular anatomy - variations
  - Type of aortic arch
  - Plaque analysis - calcification

CT-Angiography

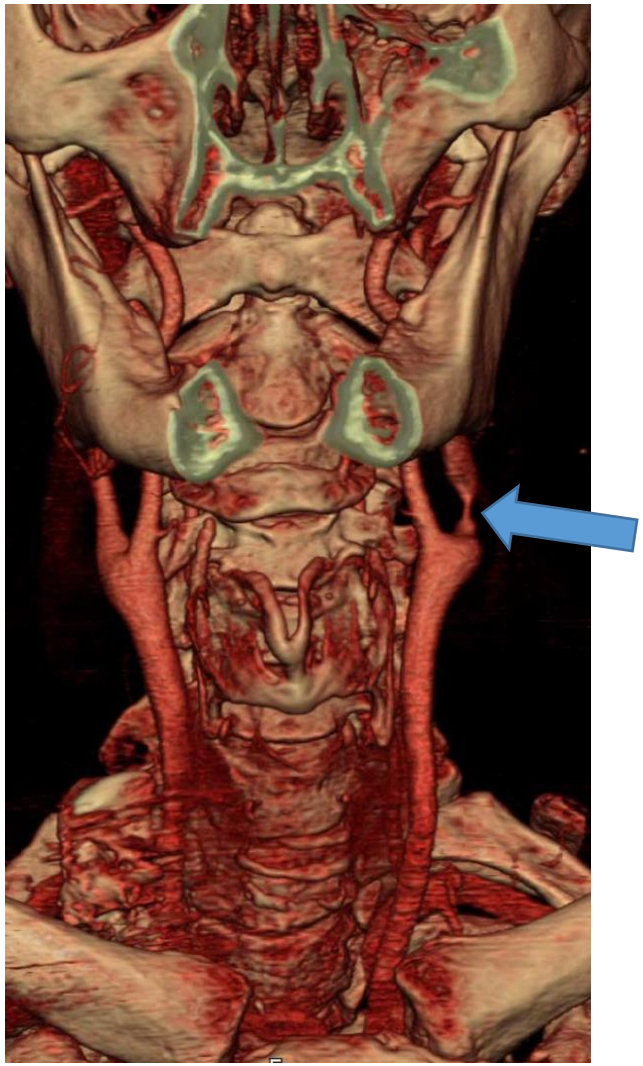


A. lusoria

CT-Angiography

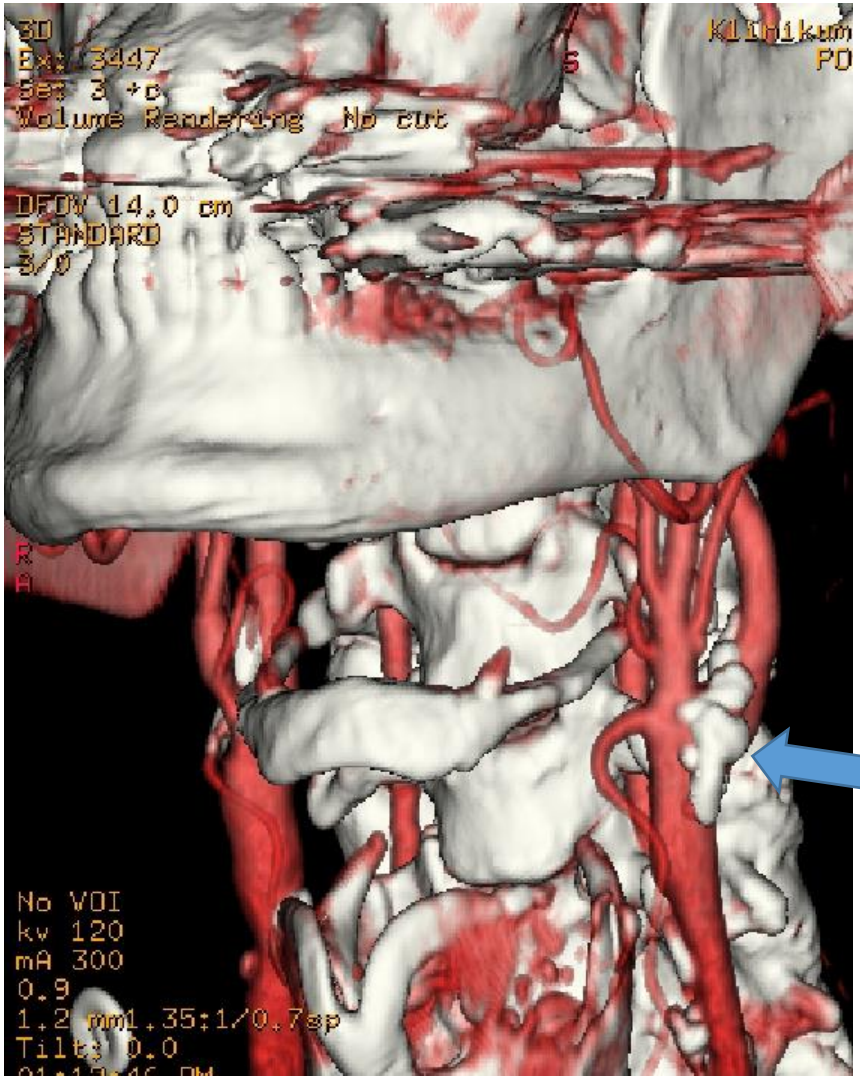
Calcification of aortic arch and supra-aortic arteries

CT-Angiography



Degree of stenosis

CT-Angiography

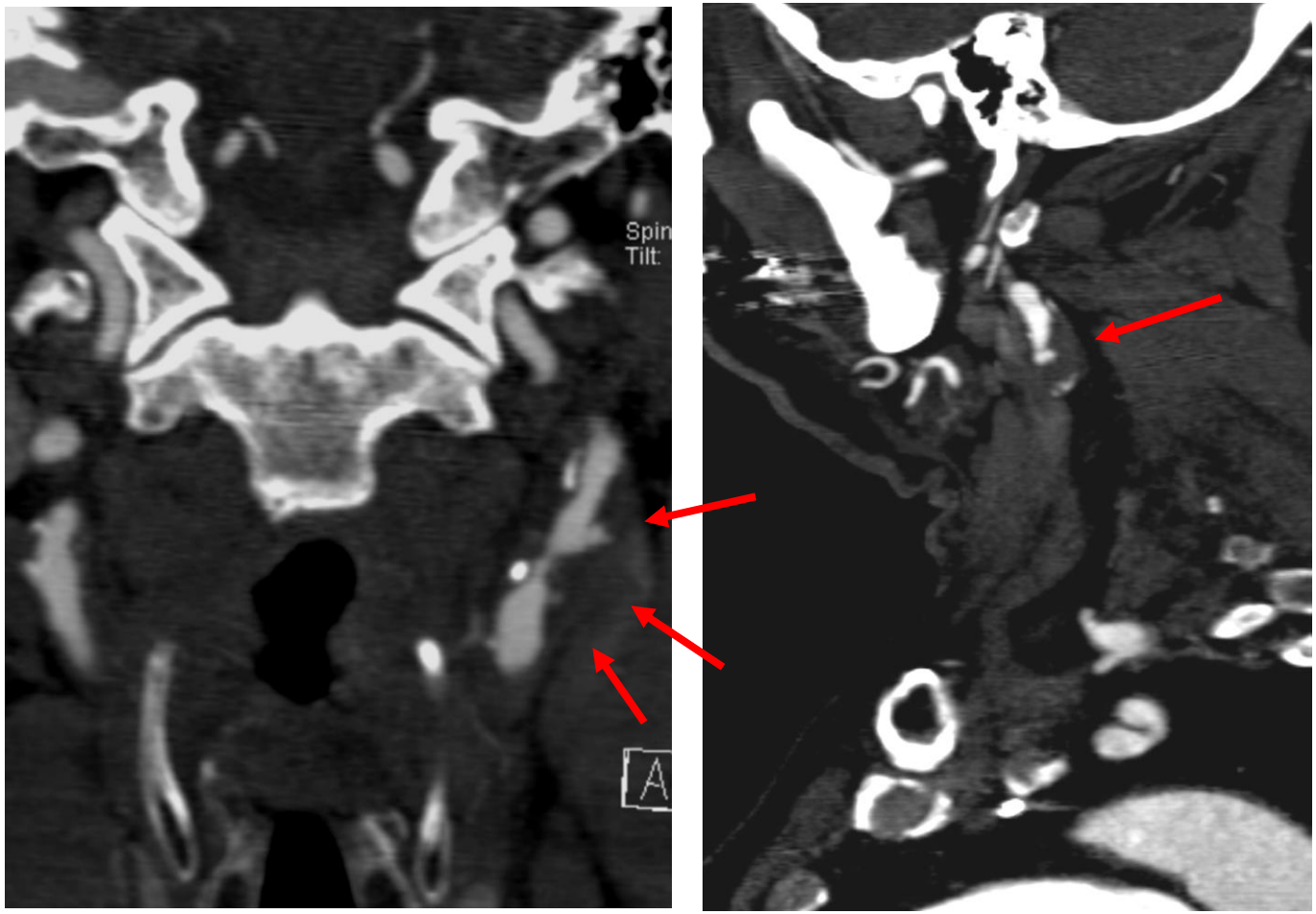


Calcified bifurcational plaque

CT-Angiography

Elongation of CCA and ICA

CT-Angiography



Soft plaques with only insignificant calcification

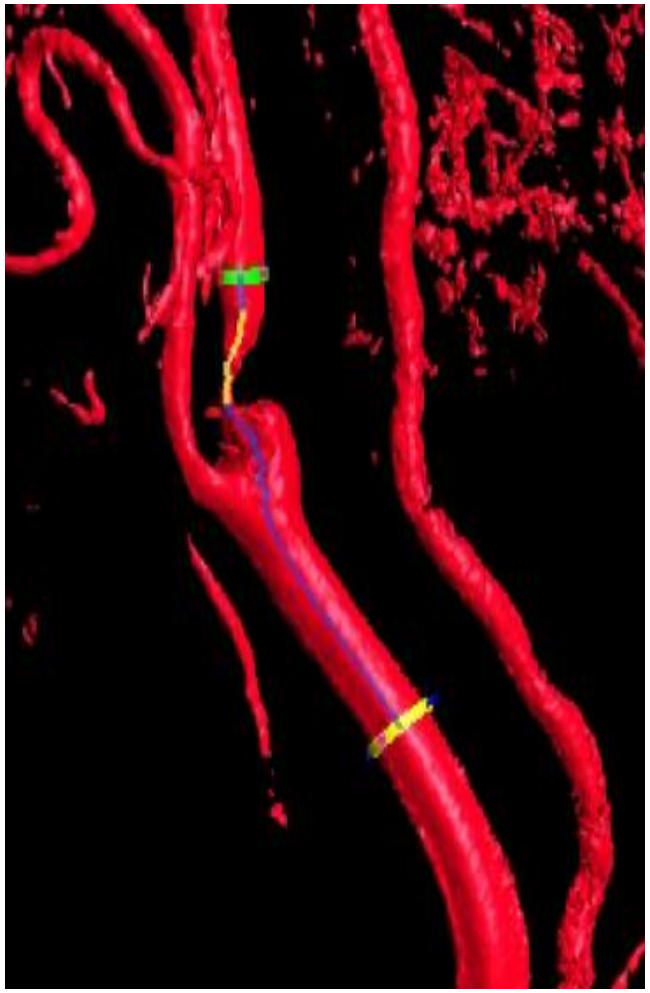
CT-Angiography

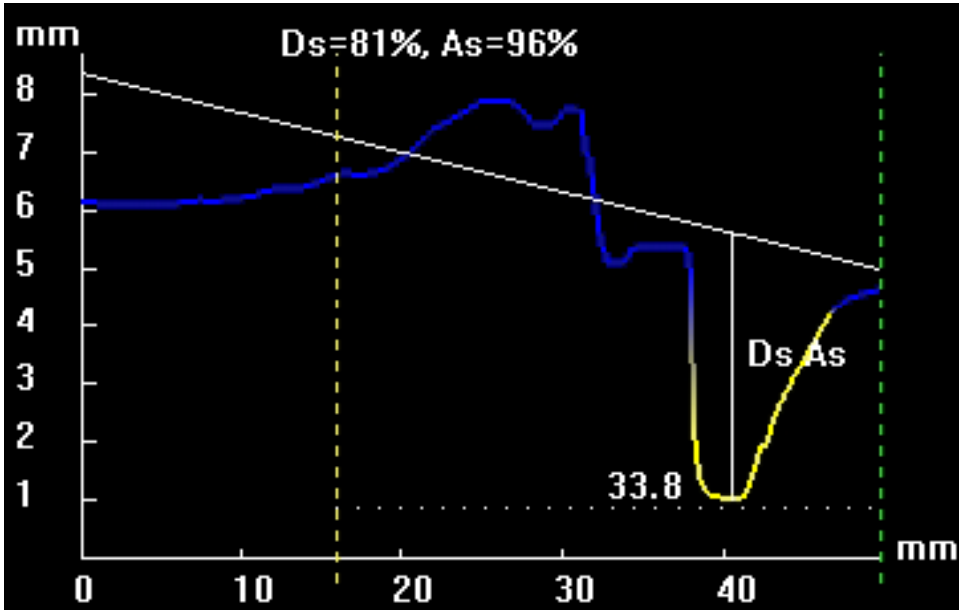
Severe ICA stenosis without calcification

CT-Angiography

Calcified ICA stenosis, but not circular

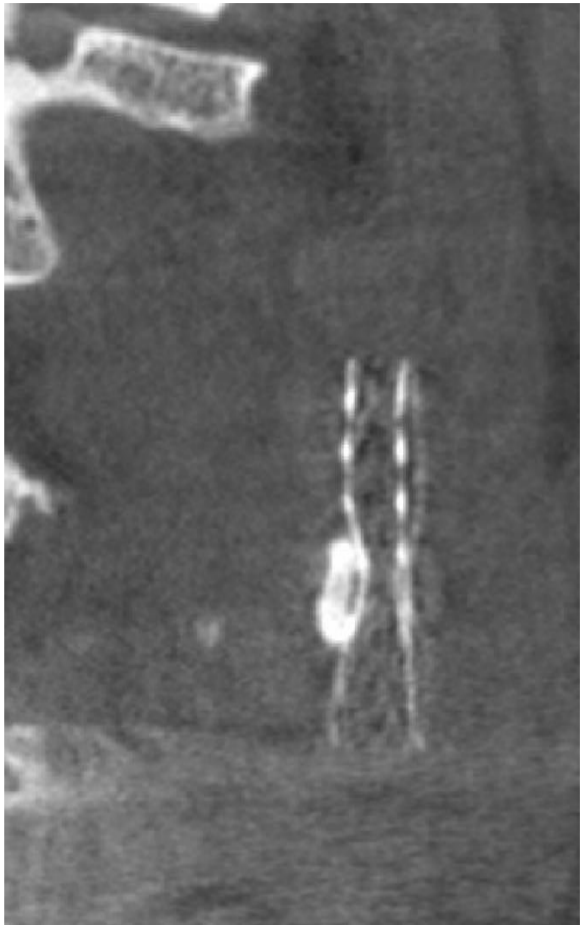
CT-Angiography





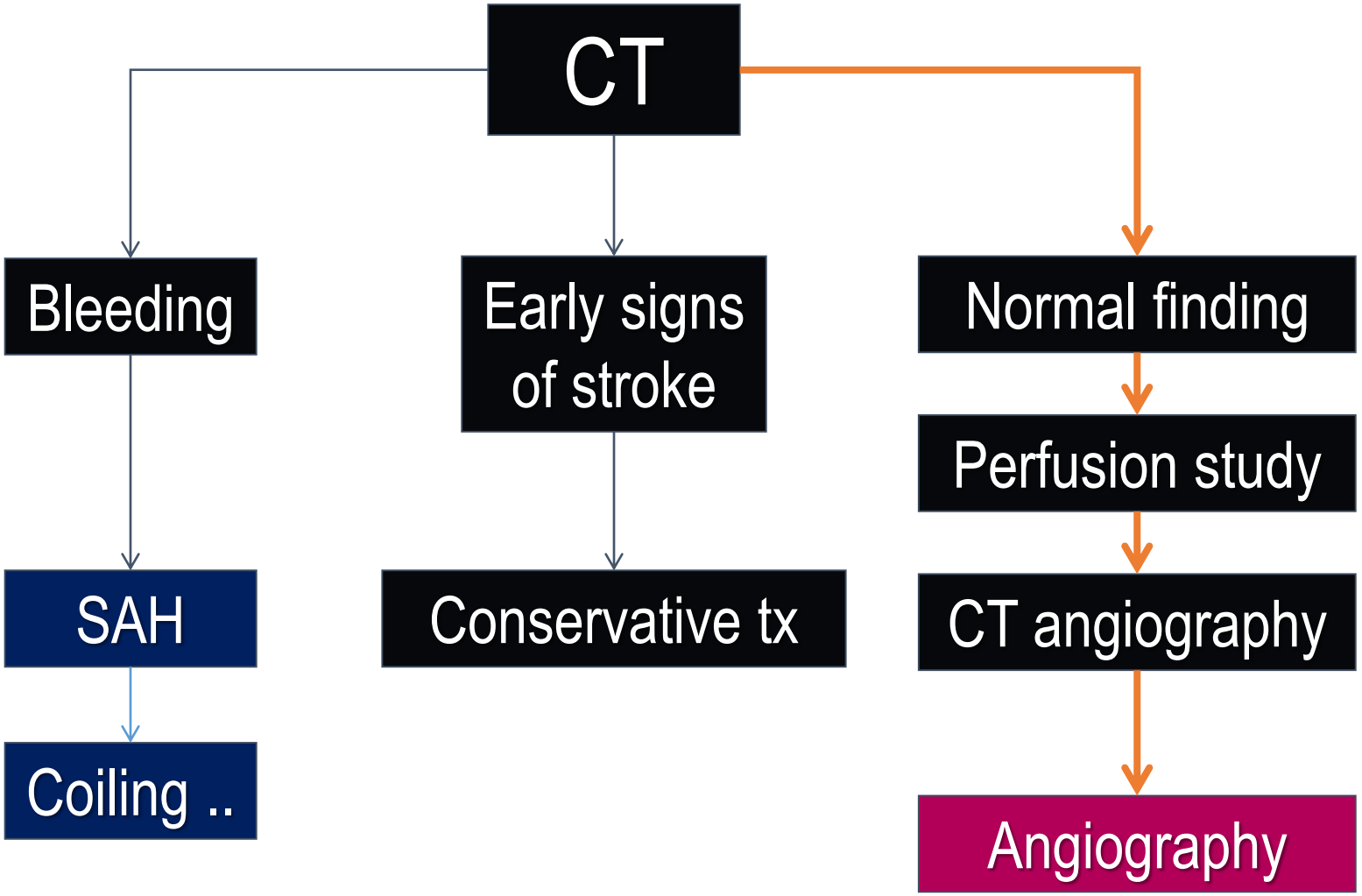
Determination of the degree of stenosis

CT-Angiography



Calcifications are the enemy of good CAS results

Diagnostic Stroke Workup



Native CT

- Focal parenchymal hypodensity
- Cortical swelling with sulcal effacement and loss of gray-white matter differentiation
- Hyperdense MCA sign

CT-Angiography

Time is Brain

Carotid and cerebral artery occlusions:

- 1.9 million brain cells die every minute
- fast recanalization must be achieved
- where is the cerebral artery occlusion located?
- CTA gives the answer!

Purpose of ASPECT

Candidate for Thrombectomy ?

- Diagnosis of ischemic stroke
- Location of obstruction
- Stage of ischemic damage

Can predict both functional outcome and risk of ICH.

ASPECTS

Barber PA, Demchuk AM, Zhang J, Buchan AM.: Validity and reliability of a quantitative computed tomography score in predicting outcome of hyperacute stroke before thrombolytic therapy. ASPECTS Study Group. Alberta Stroke Programme Early CT Score.
Lancet 2000; 355: 1670-4

What is ASPECTS?

- ASPECTS is a 10-point quantitative topographic CT scan score.
- ASPECTS was developed to offer the reliability and utility of a standard CT with a reproducible grading system to assess early ischemic changes on pre-treatment CT studies in patients with acute ischemic stroke of the anterior circulation.

Why do we need ASPECTS?

- Extent of early ischemic changes is an important predictor.
- Revascularization increases the chance of good functional outcome.
- ASPECTS was developed to standardize the detection and reporting of the extent of ischemic hypodensity.

Why do we need ASPECTS?

- ASPECTS forces standardized, meticulous examination while decision for treatment is being made in emergency situation.
- ASPECTS is useful to select patients for thrombectomy.

ASPECTS

ASPECTS is determined from evaluation of two standardized regions of the MCA territory

- basal ganglia level with thalamus, and nucleus caudatus
- supraganglionic level with the corona radiata, and centrum semiovale

ASPECTS

All cuts with basal ganglionic or supraganglionic structures visible are required to determine if an area is involved. The abnormality should be visible on at least two consecutive cuts to ensure that it is truly abnormal rather than a volume averaging effect.

ASPECTS

To compute the ASPECTS, 1 point is subtracted from 10 for any evidence of early ischemic change for each of the defined regions.

A normal CT scan receives ASPECTS of 10 points.

A score of 0 indicates diffuse involvement throughout the MCA territory.

ASPECTS Definitions

C-Caudate
I-Insular ribbon
IC-Internal Capsule
L-Lentiform nucleus
M1-Anterior MCA cortex
M2-MCA cortex lateral to the insula
M3-Posterior MCA cortex
M4, M5, M6 are the anterior, lateral and posterior MCA territories immediately superior to M1, M2 and M3, rostral to basalganglia.

ASPECTS Definitions

- Subcortical structures are allotted 3 points: C, L, and IC

- MCA cortex is allotted 7 points: insular cortex, M1, M2, M3, M4, M5 and M6

ASPECTS Prognosis

- Reliable and reproducible with low inter- and intraobserver variability.
- Within the first 3 h of MCA stroke onset, baseline ASPECTS values correlates inversely with the severity of NIHSS and with functional outcome.
- Scores of 7 or less, indicating more extensive cerebral hypoattenuation in the MCA territory, are correlated with poor functional outcome and risk of intracerebral haemorrhage.

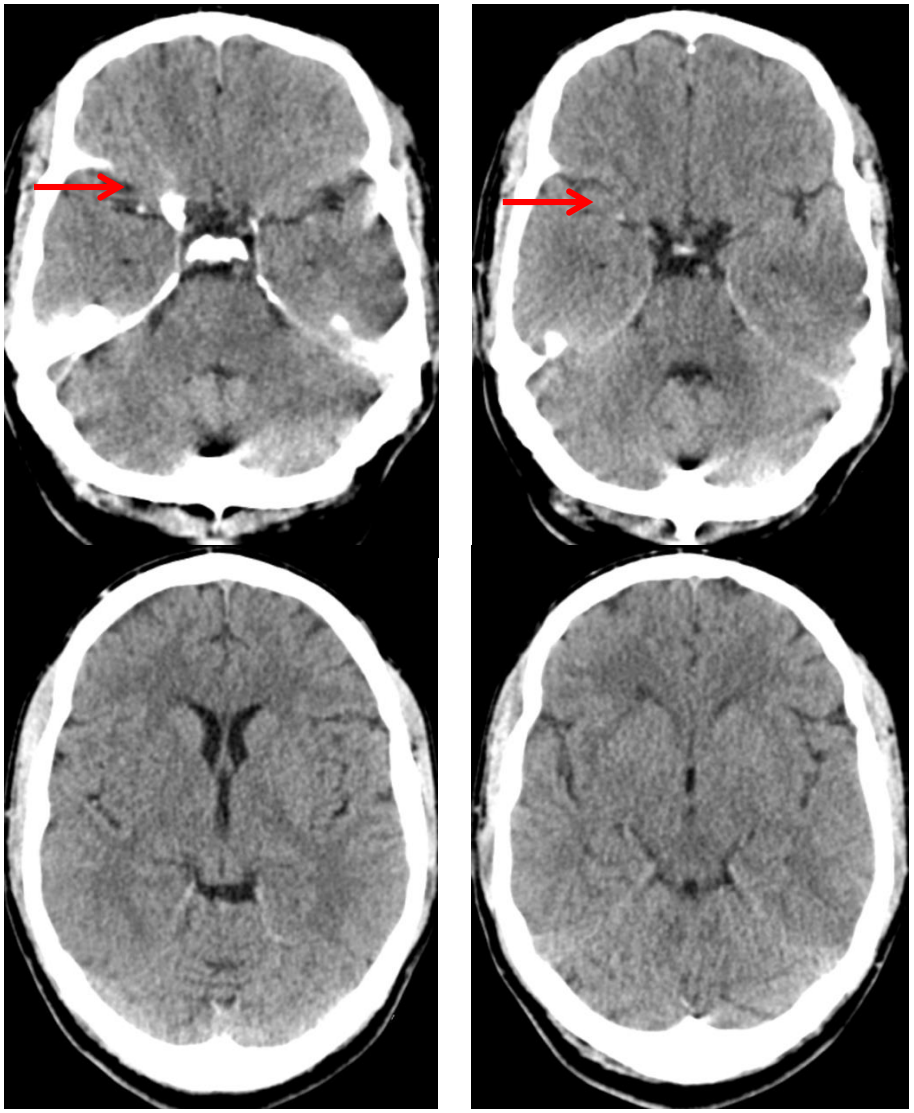
ASPECTS Limitations

- Scoring limited to MCA territory.
- Scoring is difficult in M2 region in presence of streak artefacts in the base of skull.
- Watershed infarcts are difficult to score according to ASPECTS on NCCT scans.
- Presence of subcortical and age-related periventricular white matter changes can lead to incorrect ASPECTS scoring.
- Poor scan quality like motion artefacts or tilt can lead to incorrect ASPECTS scoring.

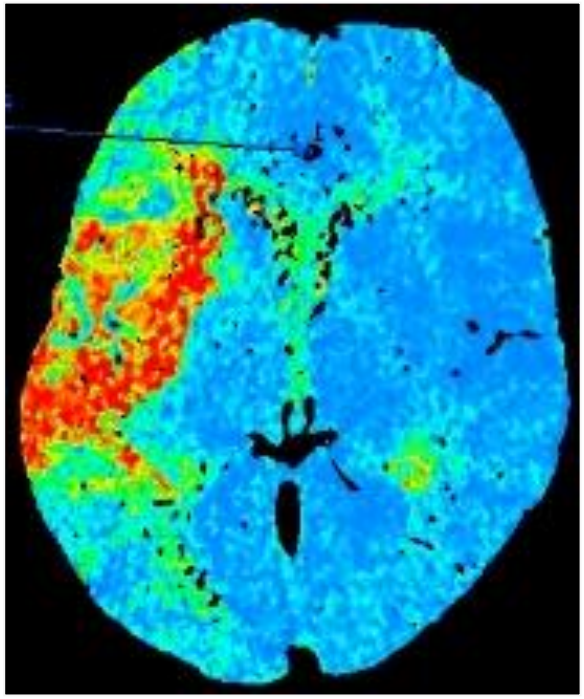
CT

Normal?

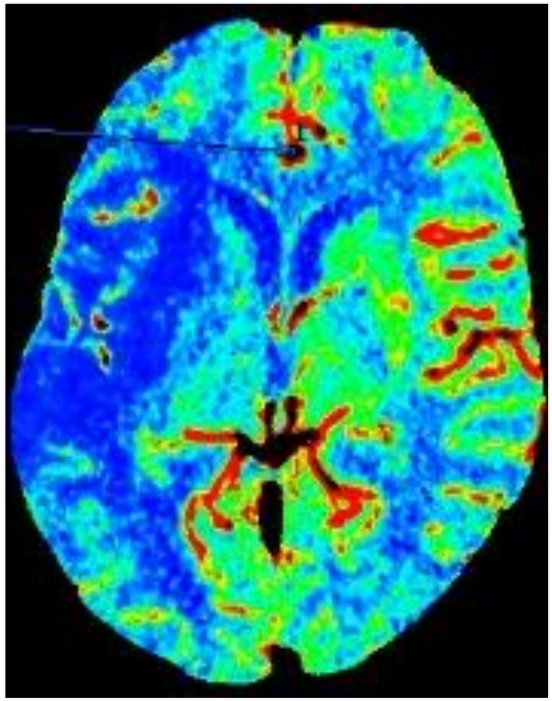
D.E. f-62
Hemiplegic for 5 hrs



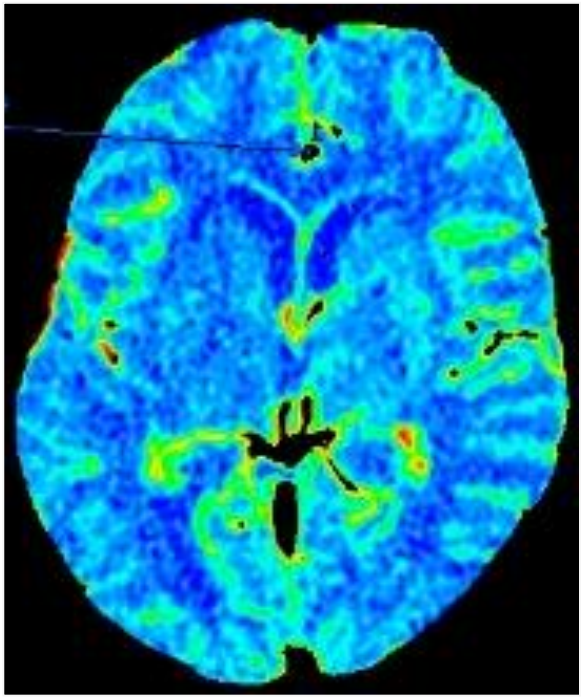
CT Perfusion



Transit time



Flow



Blood volume

D.E. f-62 Hemiplegic for 5 hrs CT: perfusion deficit

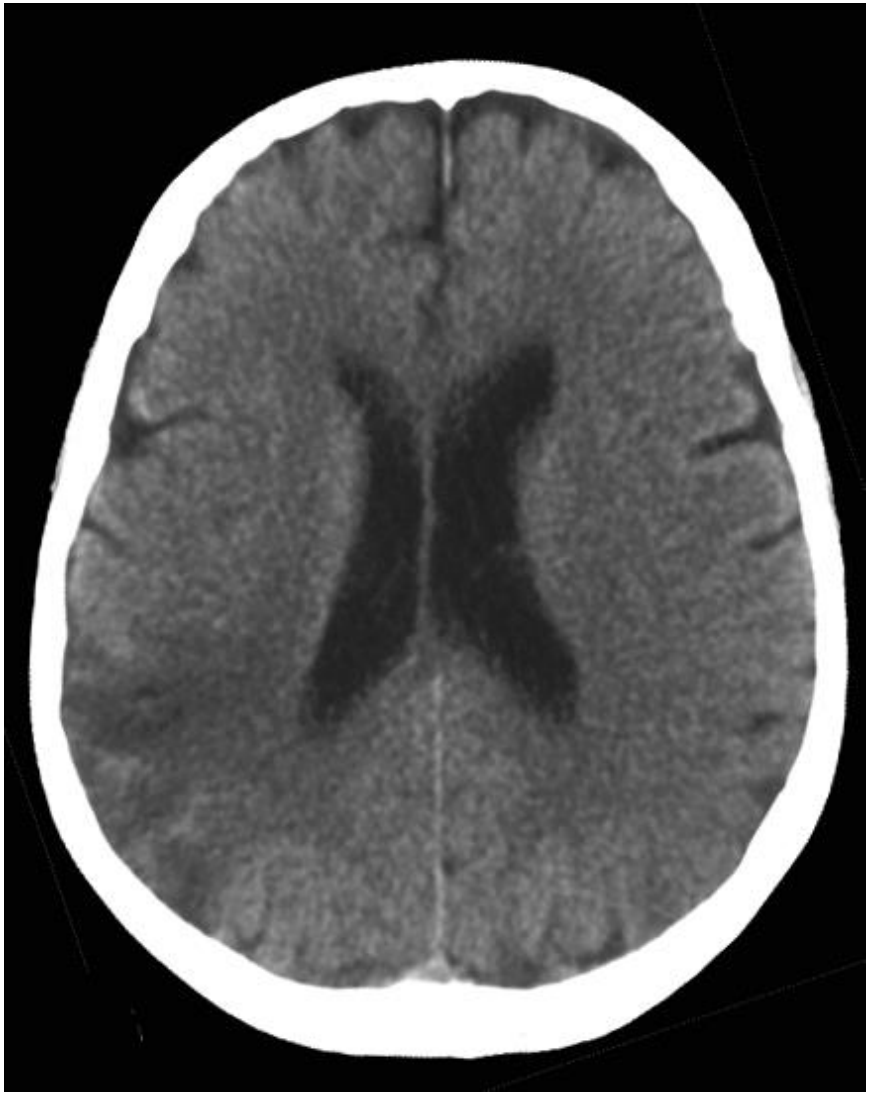
CT Angiography

D.E. f-62 Hemiplegic for 5 hours
CTA right ICA & MCA occluded

CT

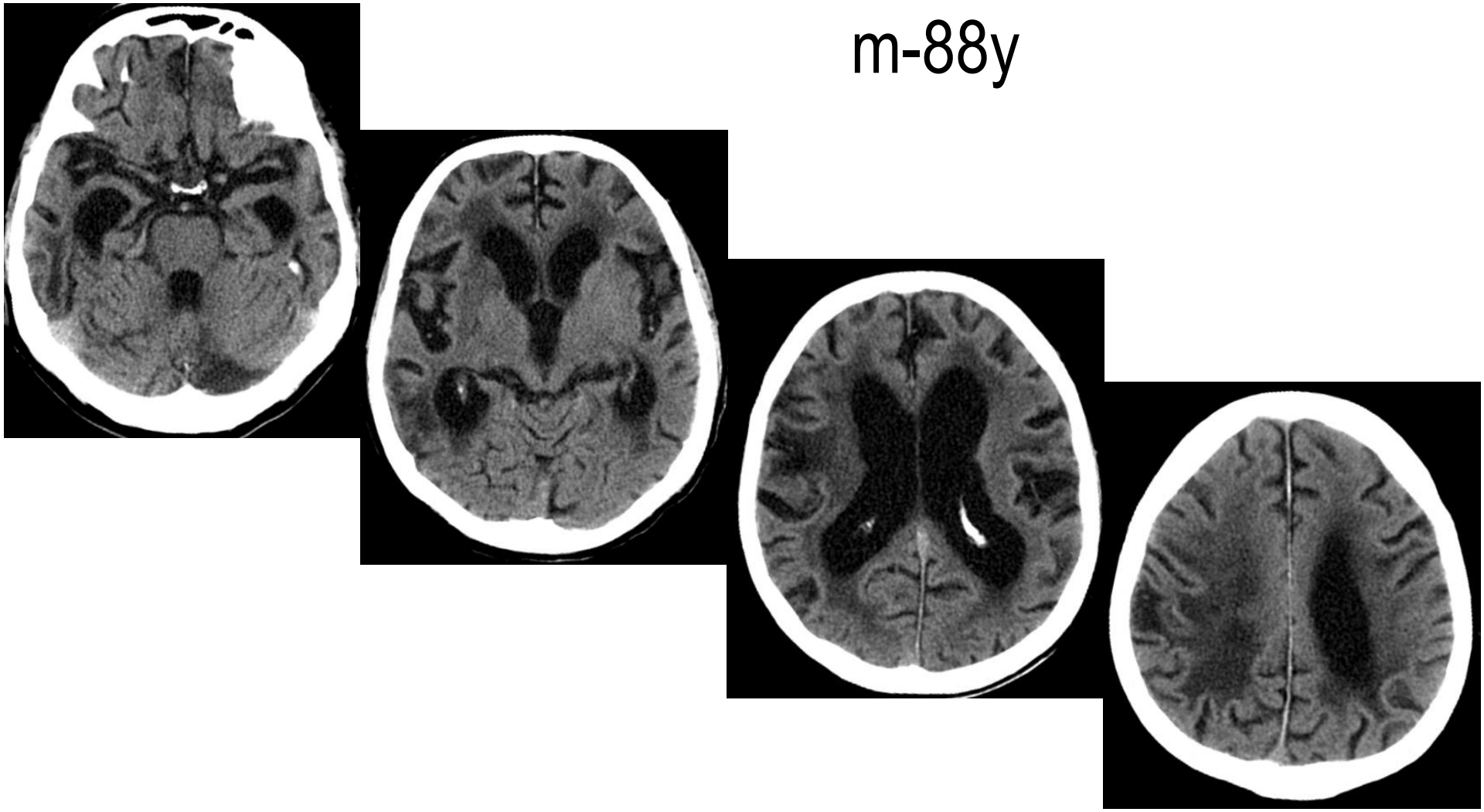
Normal?

Ischemic Infarction

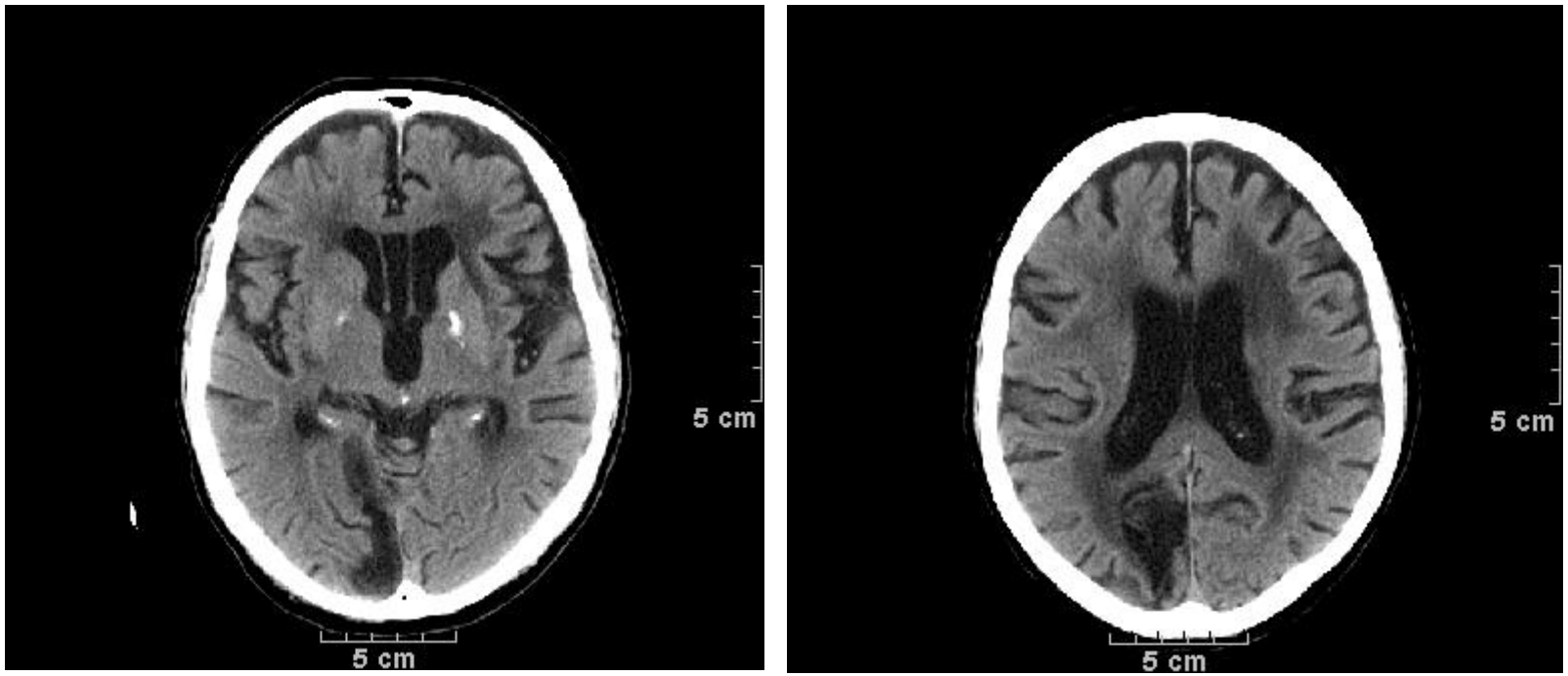


Brain atrophy
Old infarction

m-88y

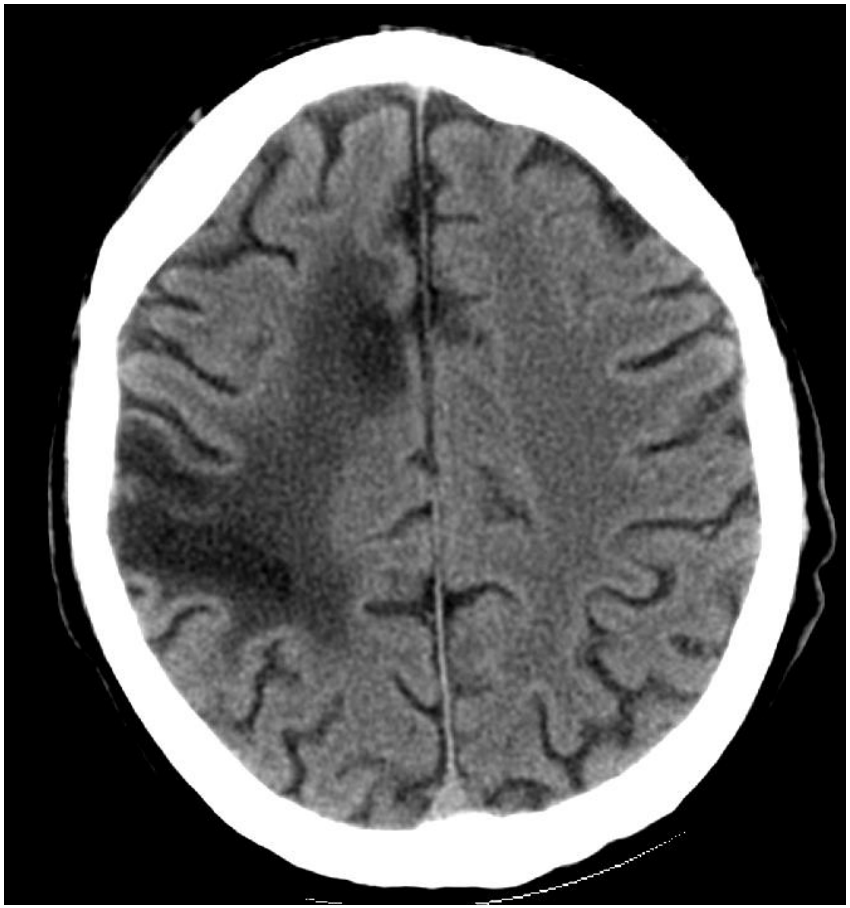


CT



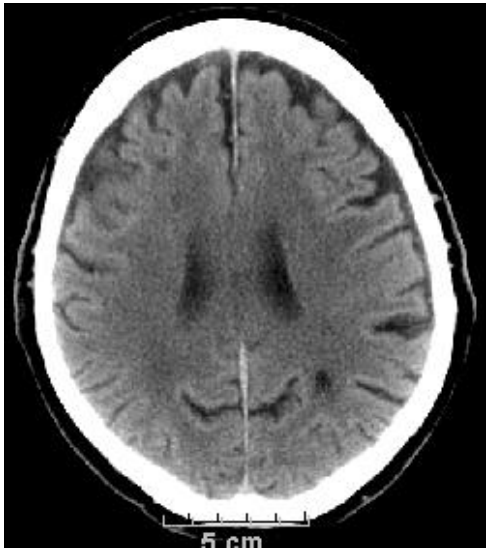
Several infarctions – Brain atrophy

CT



Scar after Infarction

CT + CT-Angiography



Acute Stroke

M. E. f-49

- Acute right sided hemiparesis
- Aphasia
- Time window 5.5 hours

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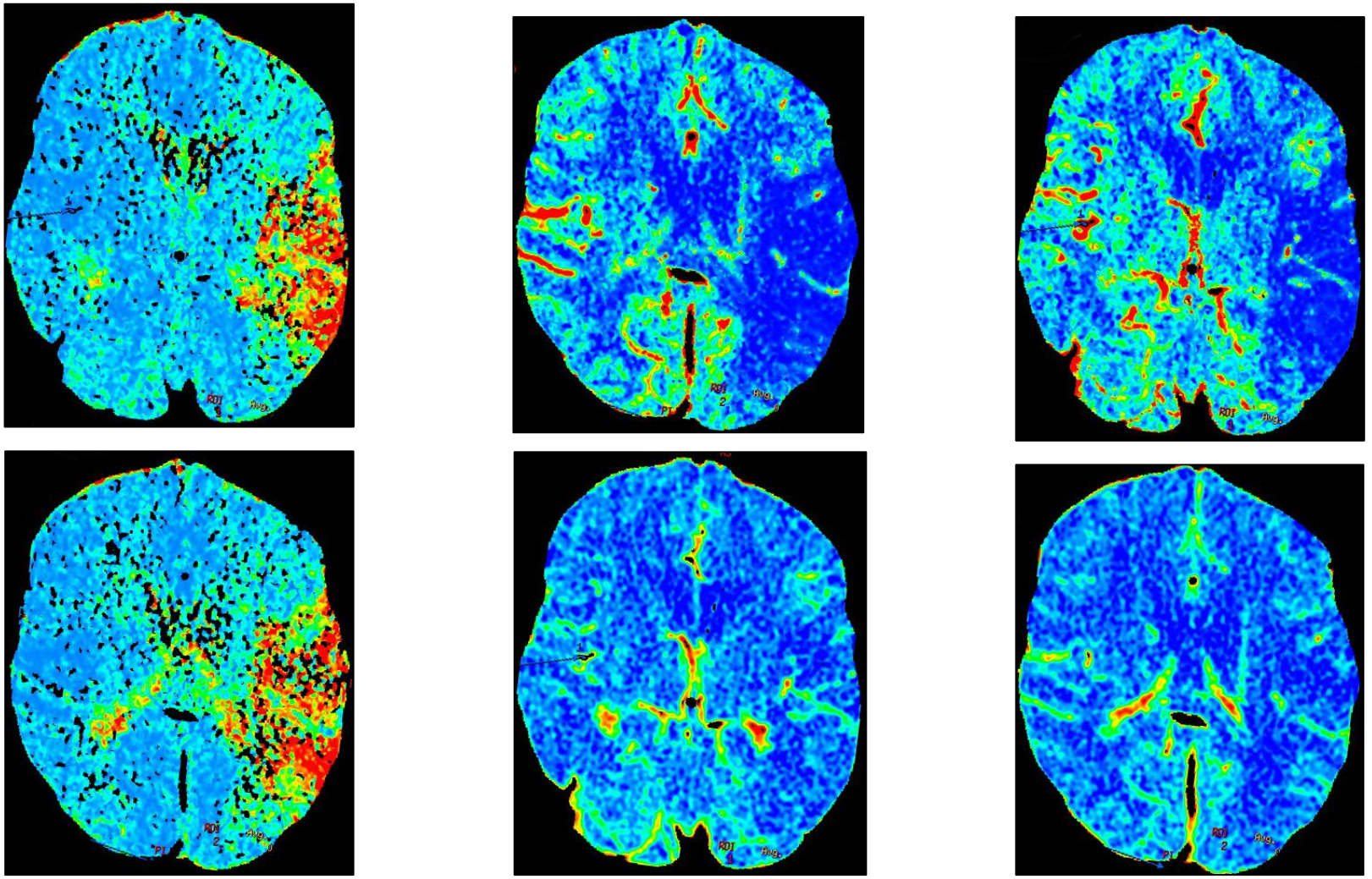
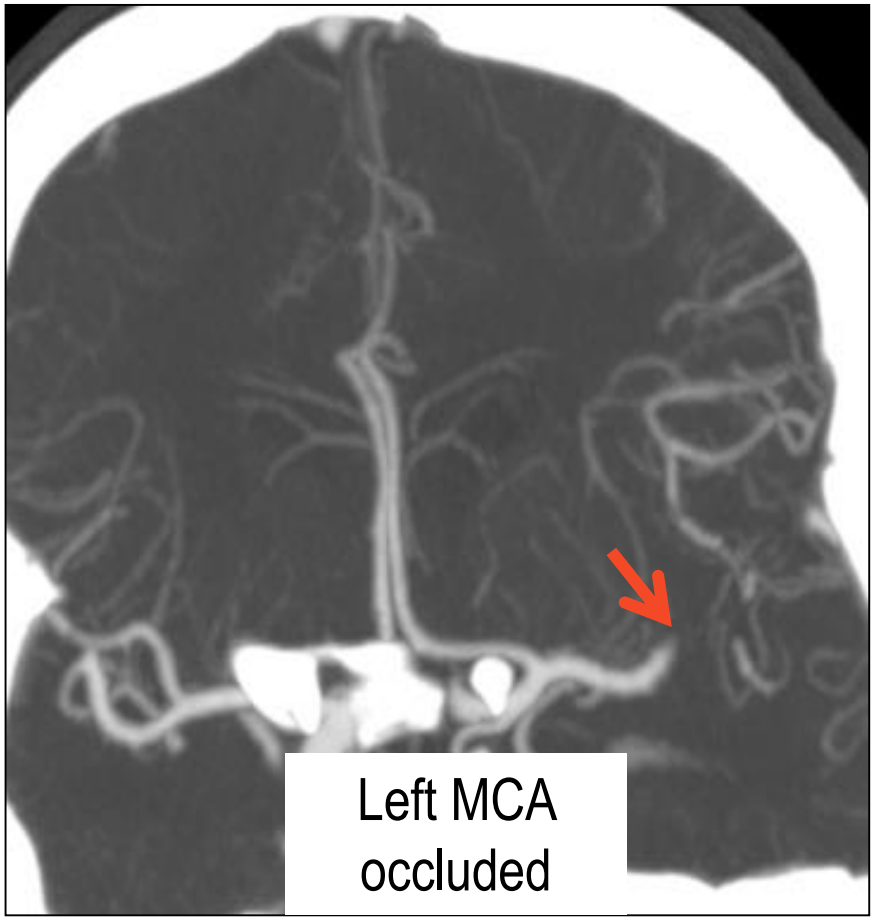
Acute Stroke - Perfusion Study



M. E. f-49

Acute Stroke - CTA



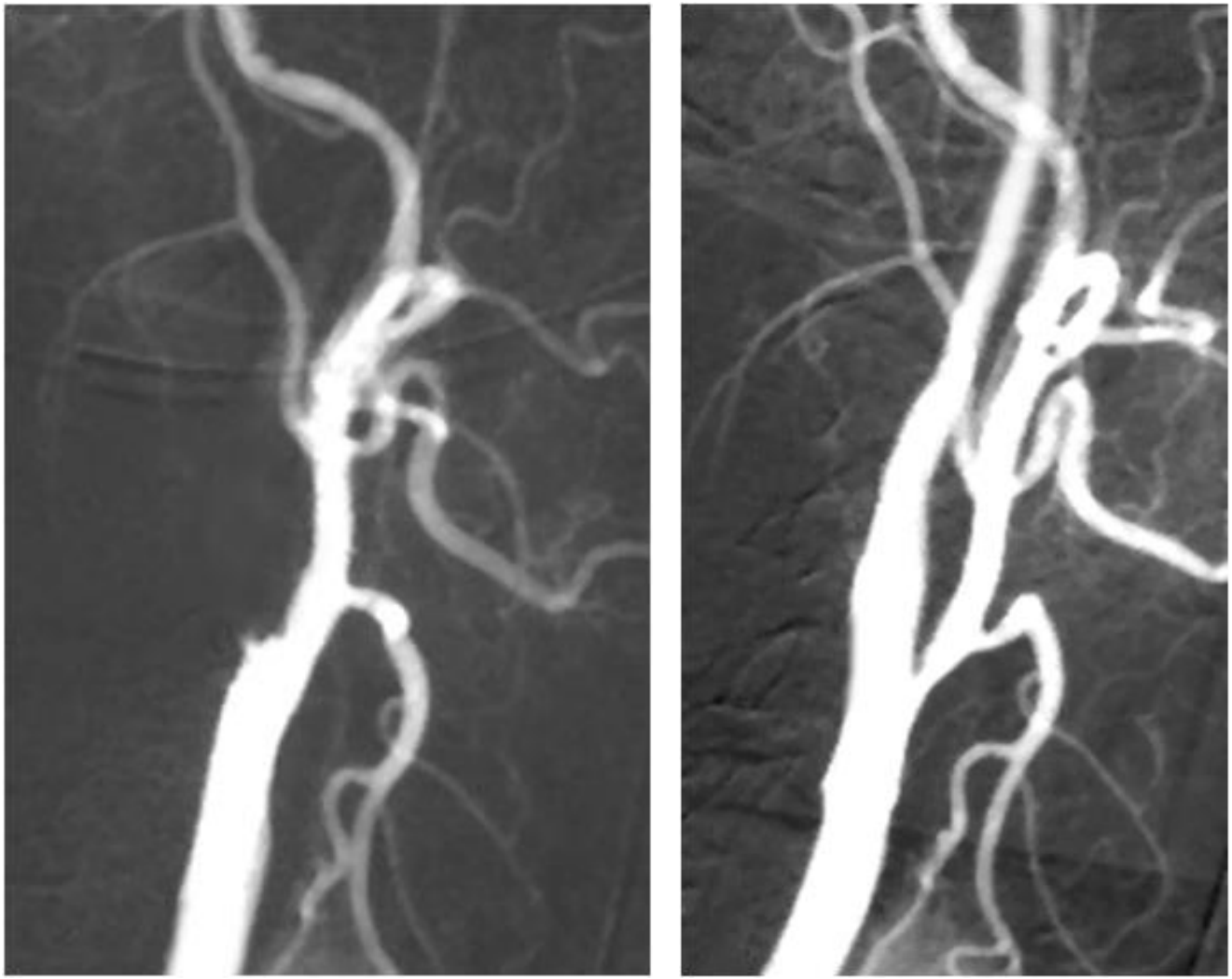
M. E. f-49

Acute Stroke

E. B. f-66

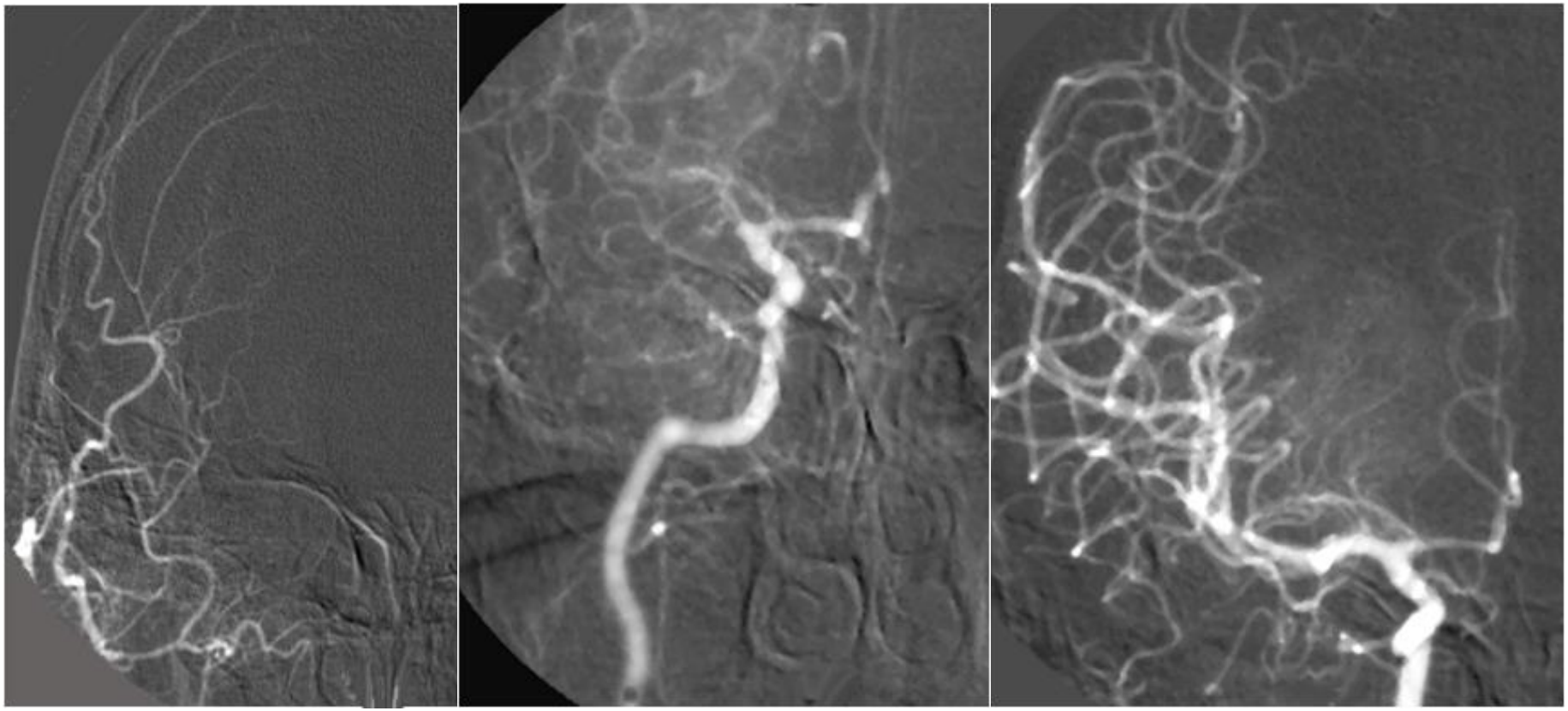
- Acute right sided hemiparesis
- Time window 4 hours ?

ICA Occlusion



E. B. f-66

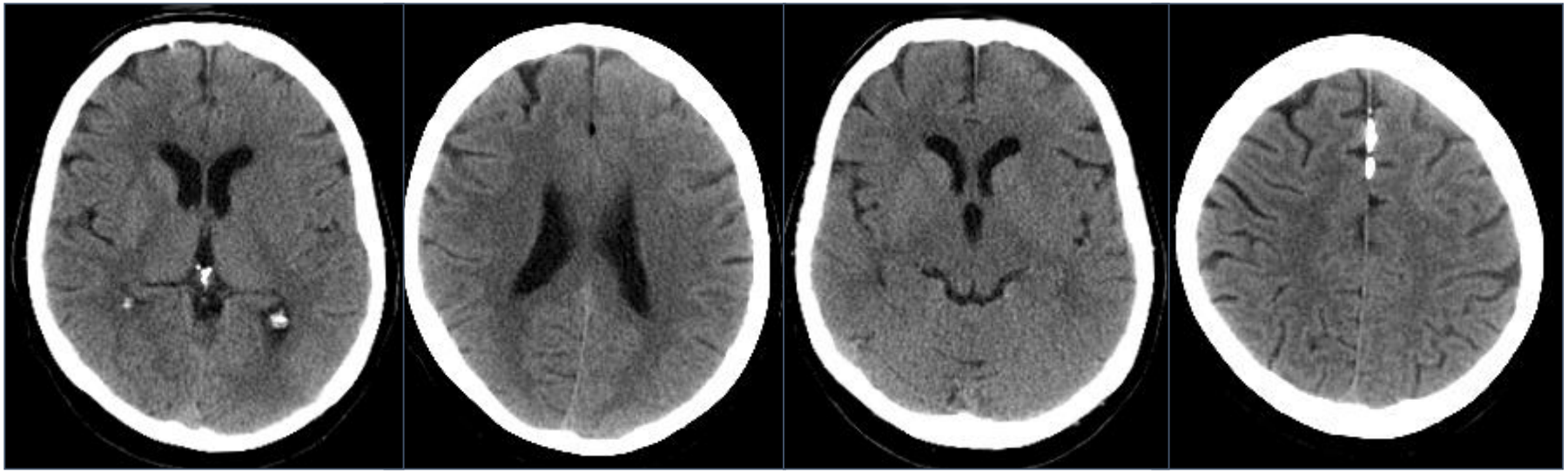
ICA Occlusion



E. B. f-66

ICA Occlusion

Stroke symptoms disappeared completely

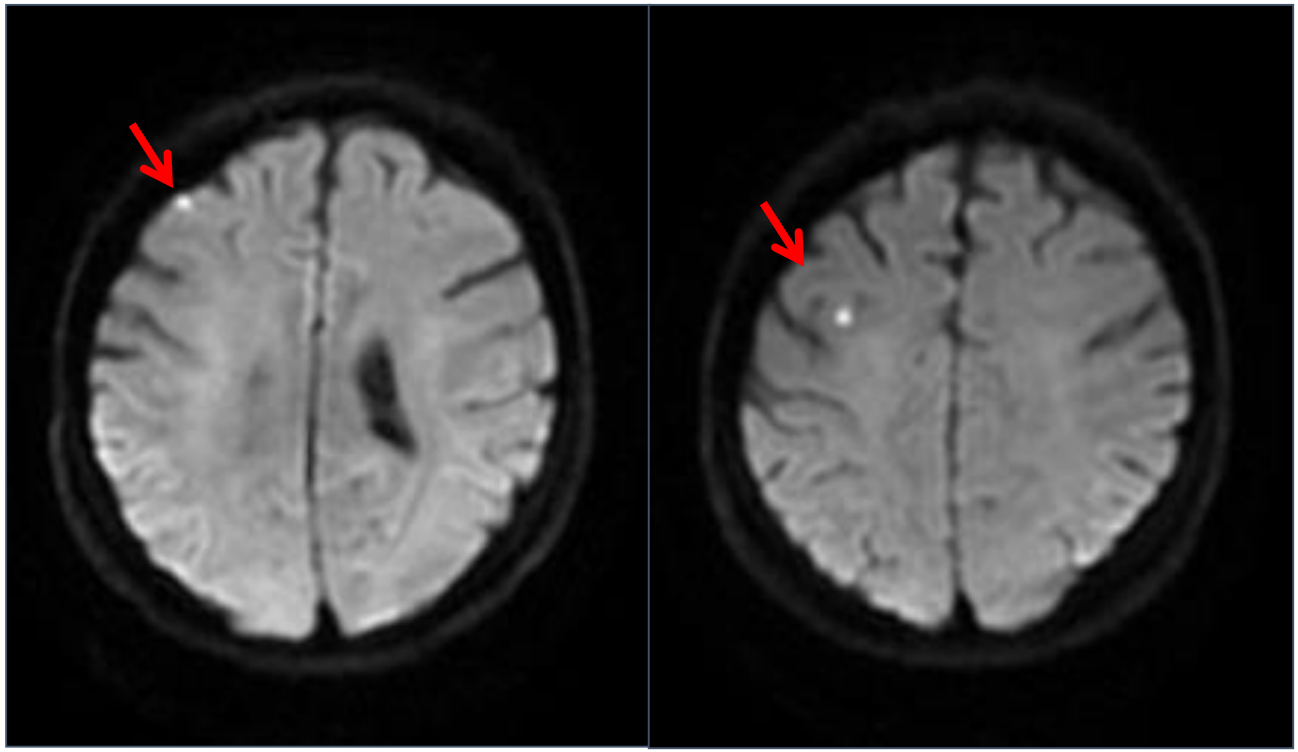


FU CT/MRI after 24 hrs

E. B. f-66

ICA Occlusion

Stroke symptoms disappeared completely



MRI after 24 hrs: 2 signal intense spots

E. B. f-66


Many thanks for your interest
in the brain!