

STEP

Baseline Imaging Assessment

Imaging Concepts

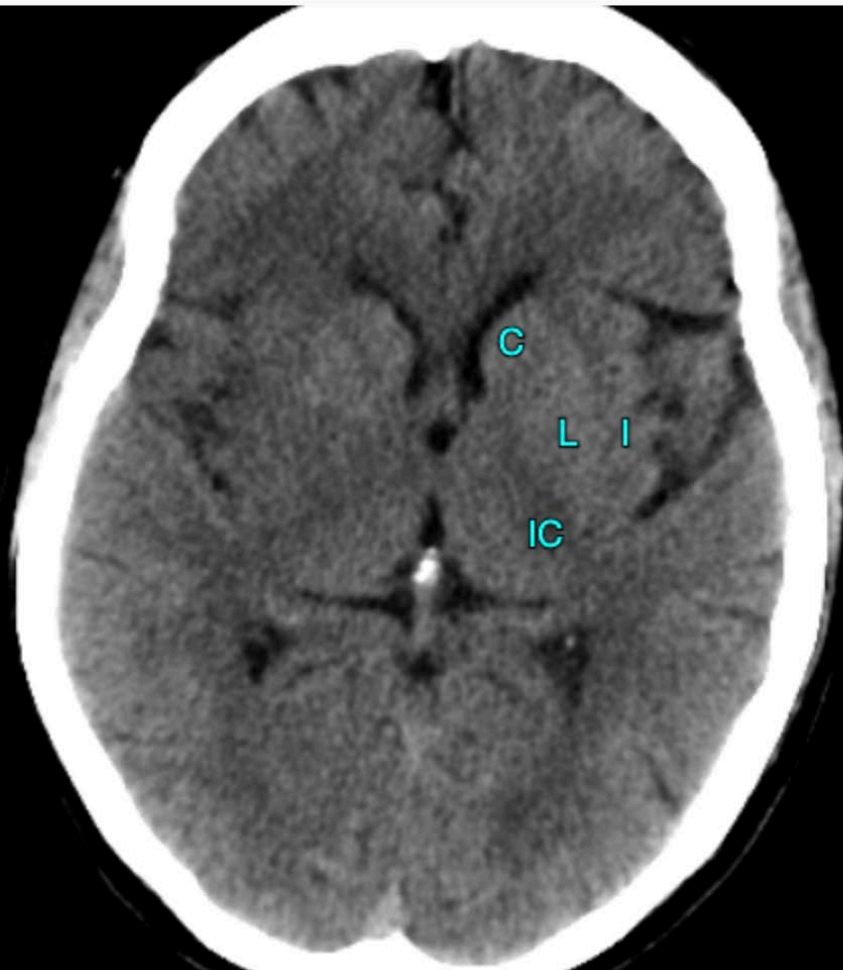
- ASPECTS
- Anatomical Definitions
- CTA-CTP role in STEP

Imaging Concepts

- **ASPECTS**
- Anatomical Definitions
- CTA-CTP role in STEP

ASPECTS (<https://www.letsgetproof.com/pages/aspect-in-stroke/homepage>)

- Based upon Non-Contrast Head CT
- Assess early changes of stroke – **loss of grey-white differentiation**
- Scored out of 10 (10 good score, all intact)
 - Each of 10 anatomical areas of hemisphere are graded 0 (infarct) or 1 (no infarct)



Calculating the ASPECTS Score:

Each area of grey white loss constitutes 1 deduction point

Subganglionic Nuclei:

- M1 - Frontal operculum -1
- M2 - Anterior temporal lobe -1
- M3 - Posterior temporal lobe -1

Supraganglionic Nuclei:

- M4 - Anterior MCA -1
- M5 - Lateral MCA -1
- M6 - Posterior MCA -1

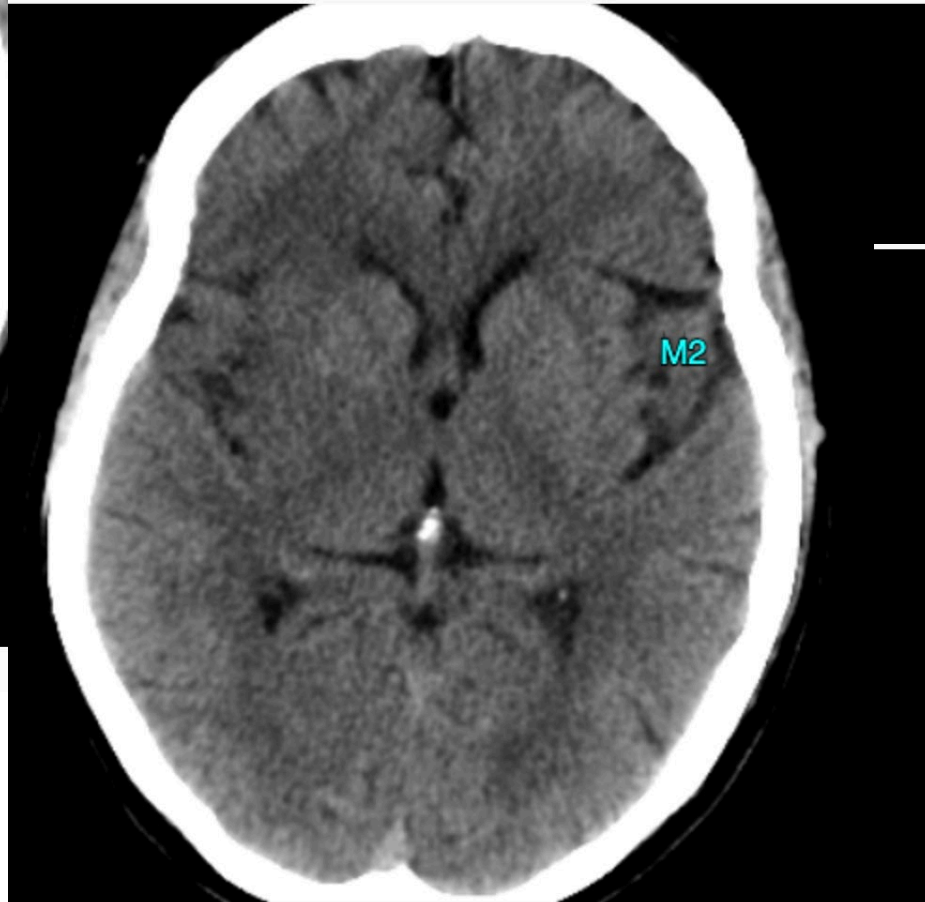
Basal Ganglia:

- Caudate (C) -1
- Lentiform Nucleus (L) -1
- Insula (I) -1
- Internal Capsule (IC) Post Limb -1

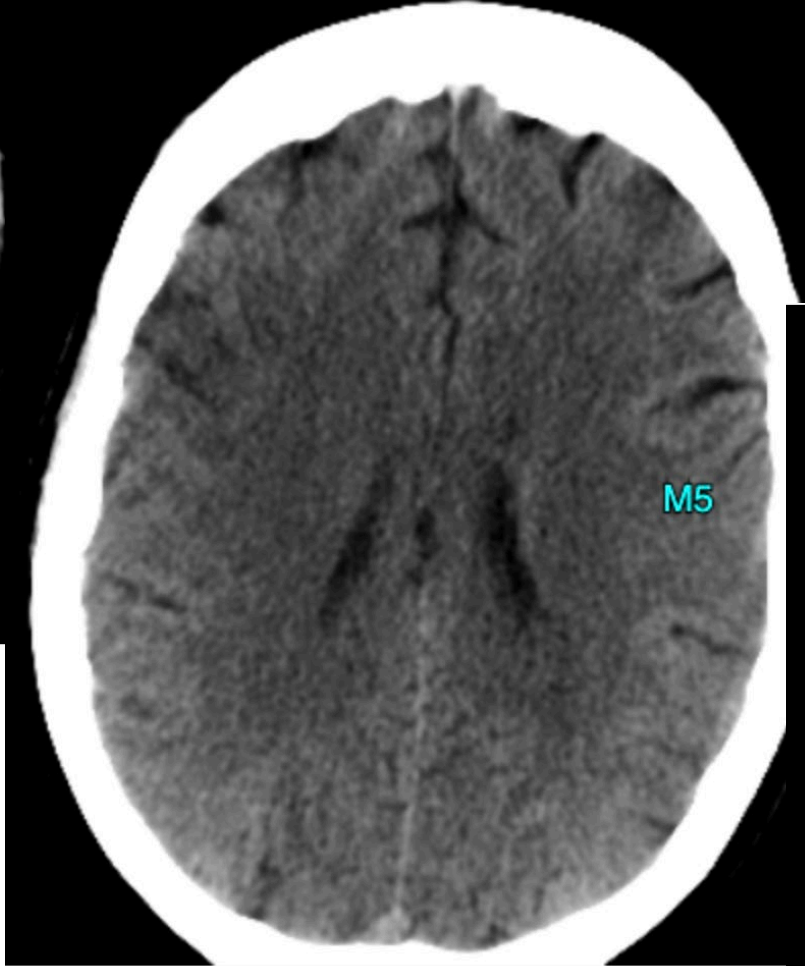
Total ASPECTS Score. **/10**

Traditional ASPECTS

M1-3 = at the level of the BG



M4-6 = above the BG at the level of the lateral ventricles



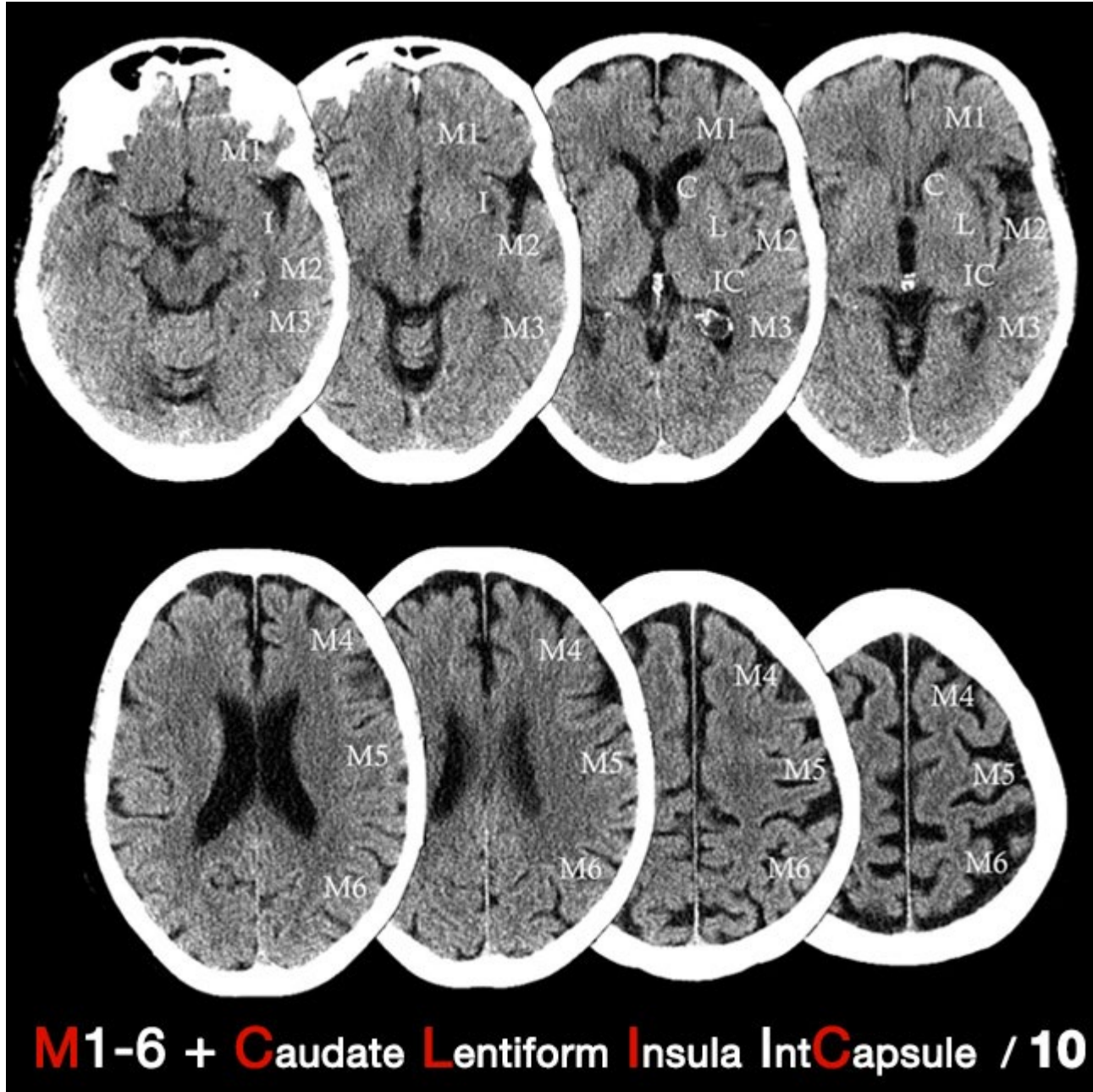
UPDATED ASPECTS

Uses entire CT scan

Any involvement loses a point for that territory

*But...If MRI is used

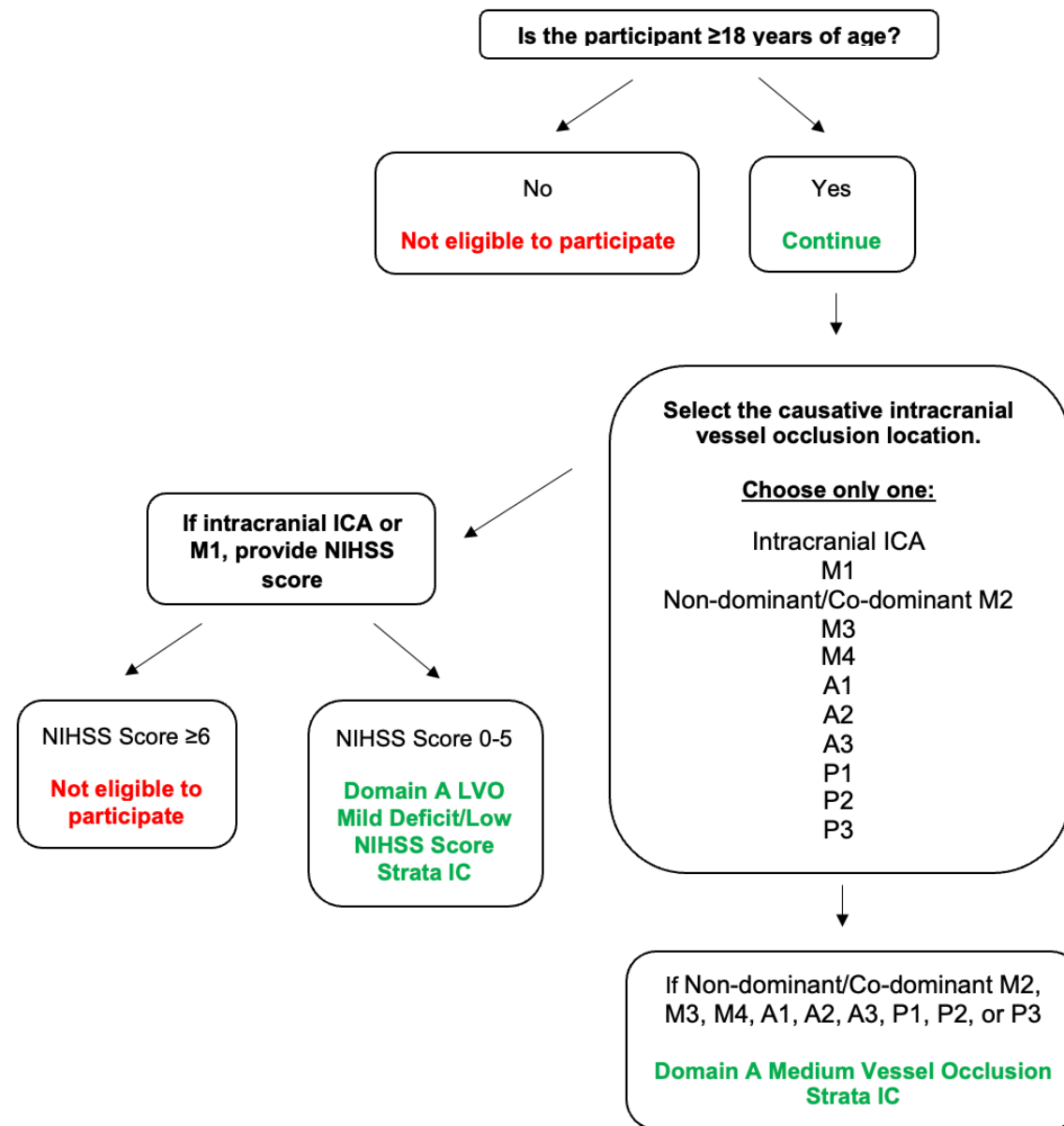
Any involvement loses a point for that territory...but add one point to the score due to high sensitivity of MRI



Imaging Concepts

- ASPECTS
- Anatomical Definitions**
- CTA-CTP role in STEP

STEP REDCap eConsent: IC Distribution Algorithm Diagram

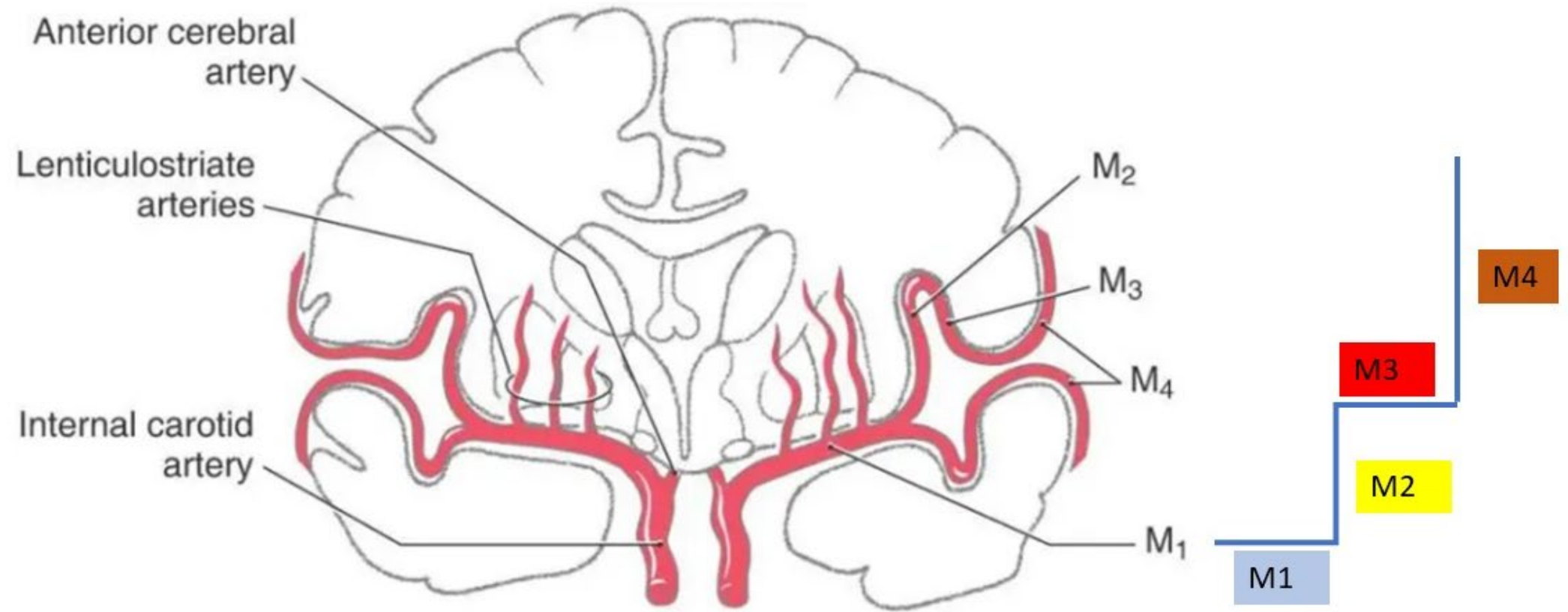


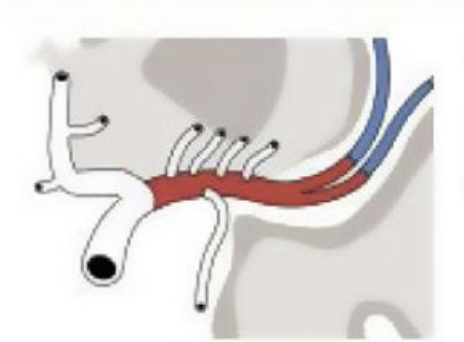
CTA-CTP Role in Identifying Distal Occlusions

- Role of CTP in STEP = to increase the conspicuity of distal occlusions
- Definitions of “MEVO/DVO” = Vessels
 - Non-dominant/Co-Dominant M2 and distal
 - M3,M4
 - ACA: A1,A2, and A3
 - PCA: P1, P2 and P3

MCA segments

- Operational definition of the MCA segments:
 - **M1 segment:** Initial stem of the MCA including small penetrating branches and the anterior temporal artery branch.
 - **M2 segment:** First non-penetrator branching that occurs **after take-off the anterior temporal artery** branch.
 - The anterior temporal artery branch of the M1 may be identified by the confinement of its course to the anterior temporal lobe.
 - If a branch artery exits the Sylvian fissure and supplies territory beyond the anterior temporal lobe (including the posterior temporal or low parietal regions), it is considered an M2 MCA segment rather than an anterior temporal artery branch.
 - The M2 MCA continues through the **entire vertical course** of branches up the Sylvian fissure
 - **M3 MCA starts with the turn of these branches to run horizontally under the temporal lobe.**

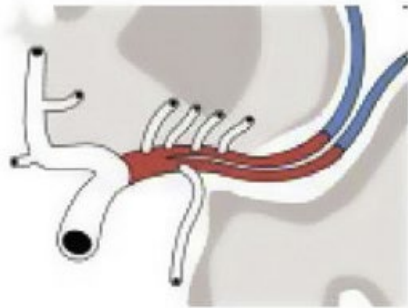




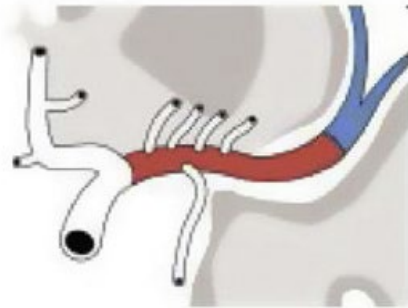
standard division

Bifurcation-Trifurcation in Fissure = M2
(Stem-and-Branch Definition of M2)

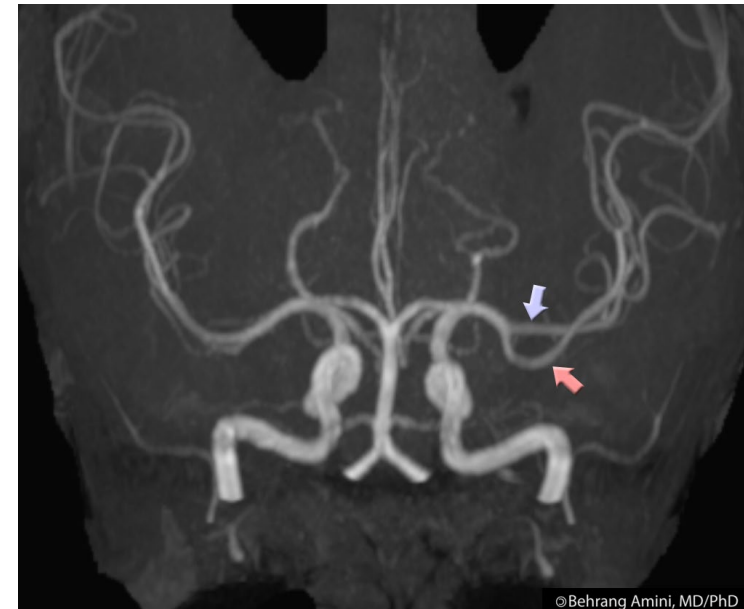
trunk division



early division



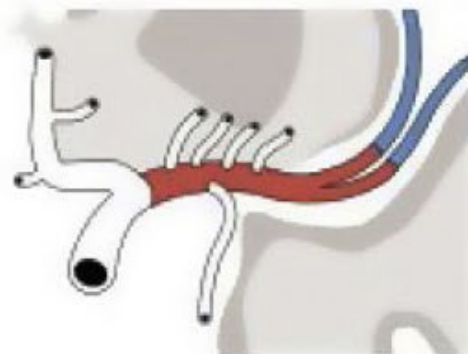
late division



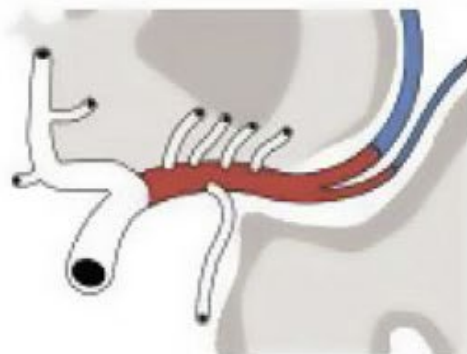
Non-dominant/Co-Dominant M2 based on CTA or MRA (plus information from CTP/MRP)

- **Dominant** if it supplies **>50%** of the MCA territory
 - Branch lumen diameter **>50%** of M1 stem diameter
- **Co-dominant** if it supplies **~50%** of the MCA
 - Branch lumen diameter **~50%** of M1 stem diameter
- **Non-dominant** if it supplies **<50%** of the MCA territory
 - Branch lumen diameter **<50%** of M1 stem diameter

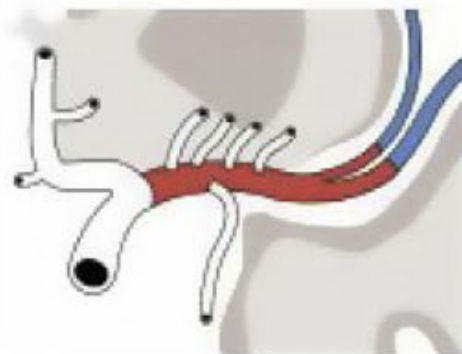
dominance



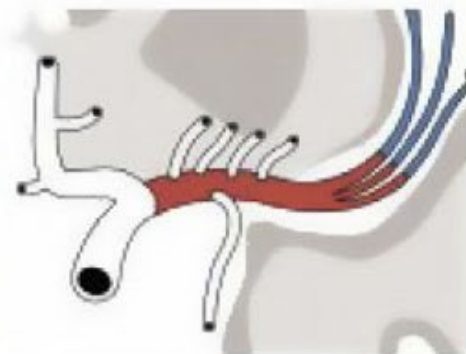
bifurcation, no dominance



superior branch dominance



inferior branch dominance



trifurcation, no dominance

Non-dominant/Co-Dominant M2 based on CTP or PWI MRI

- **Dominant** if it supplies **>50%** of the MCA territory
 - Tmax>4s volume >100cc
- **Co-dominant** if it supplies **~50%** of the MCA
 - Tmax>4s volume ~100cc
- **Non-dominant** if it supplies **<50%** of the MCA territory
 - Tmax>4s volume <100cc

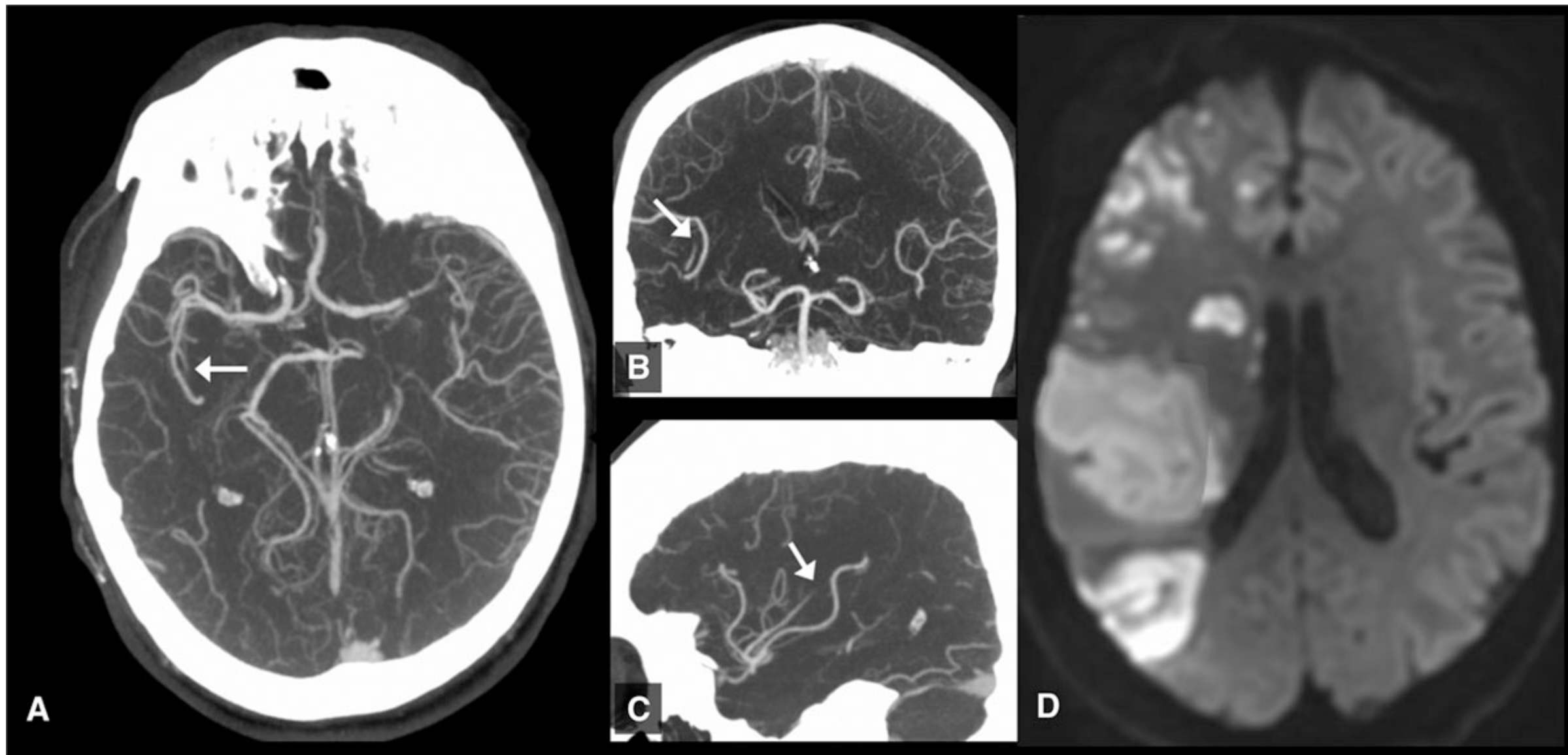
*Blue on RAPID....Green on RAPID is Tmax > 6s

Imaging Concepts

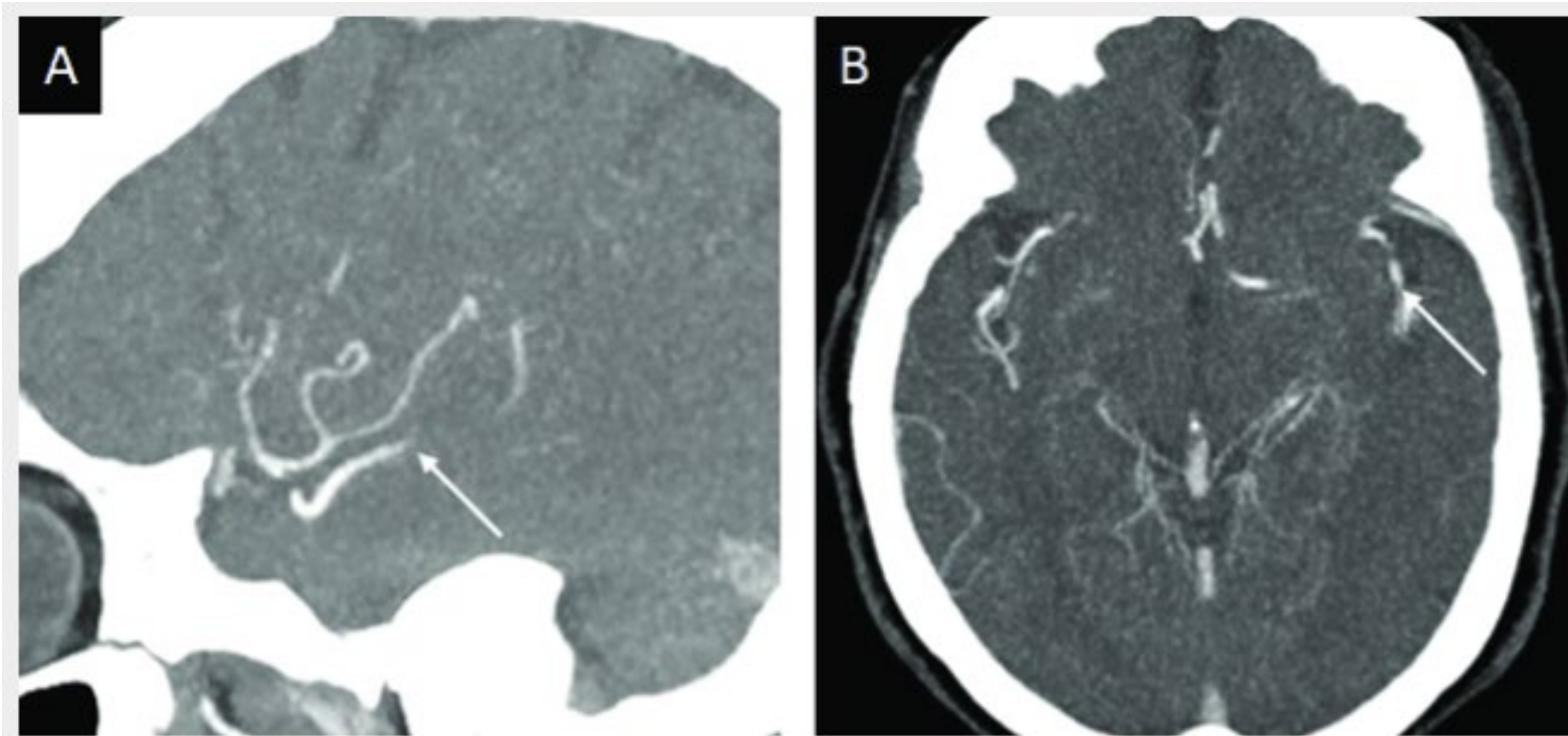
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CTP Definitions of Eligible Distal Occlusions

- CTP/MRP Definition
 - **"Perfusion lesion ($T_{max} > 4.0$ seconds) volume ≥ 10 cc on CTP or MR PWI within the territory of the anterior cerebral artery (ACA) segments, a non-dominant or co-dominant M2 middle cerebral artery (MCA) segment, an M3 MCA, or the posterior cerebral artery (PCA) segments."**
 - **Less than 50% core** in the territory supplied by the occluded vessel as evident by **hypodensity and loss of grey-white border on NCCT** or **ADC < 620 mm²/s on diffusion MRI** or **rCBF $< 30\%$ on CTP after 6h of symptom onset.**

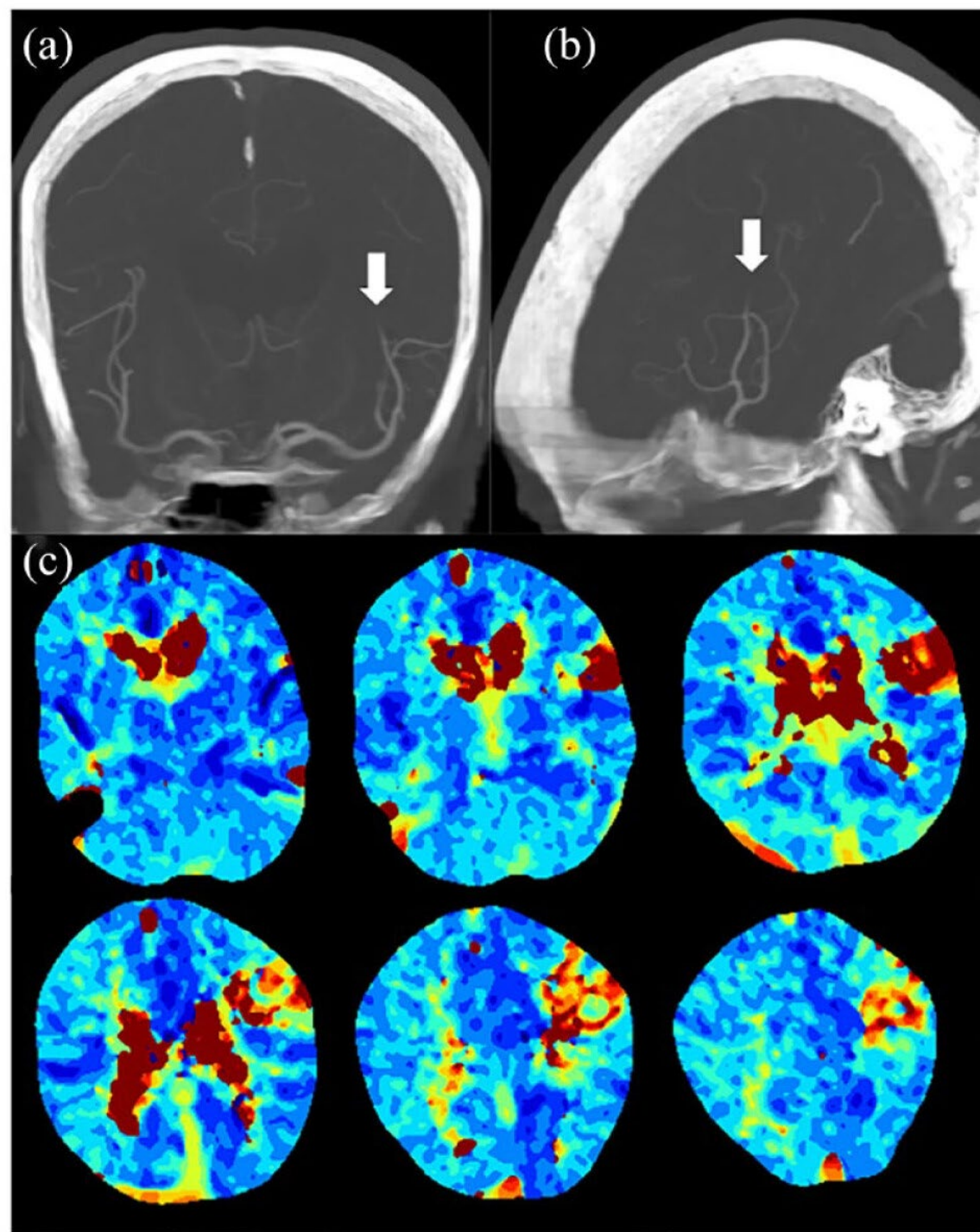


Non-Dominant M2

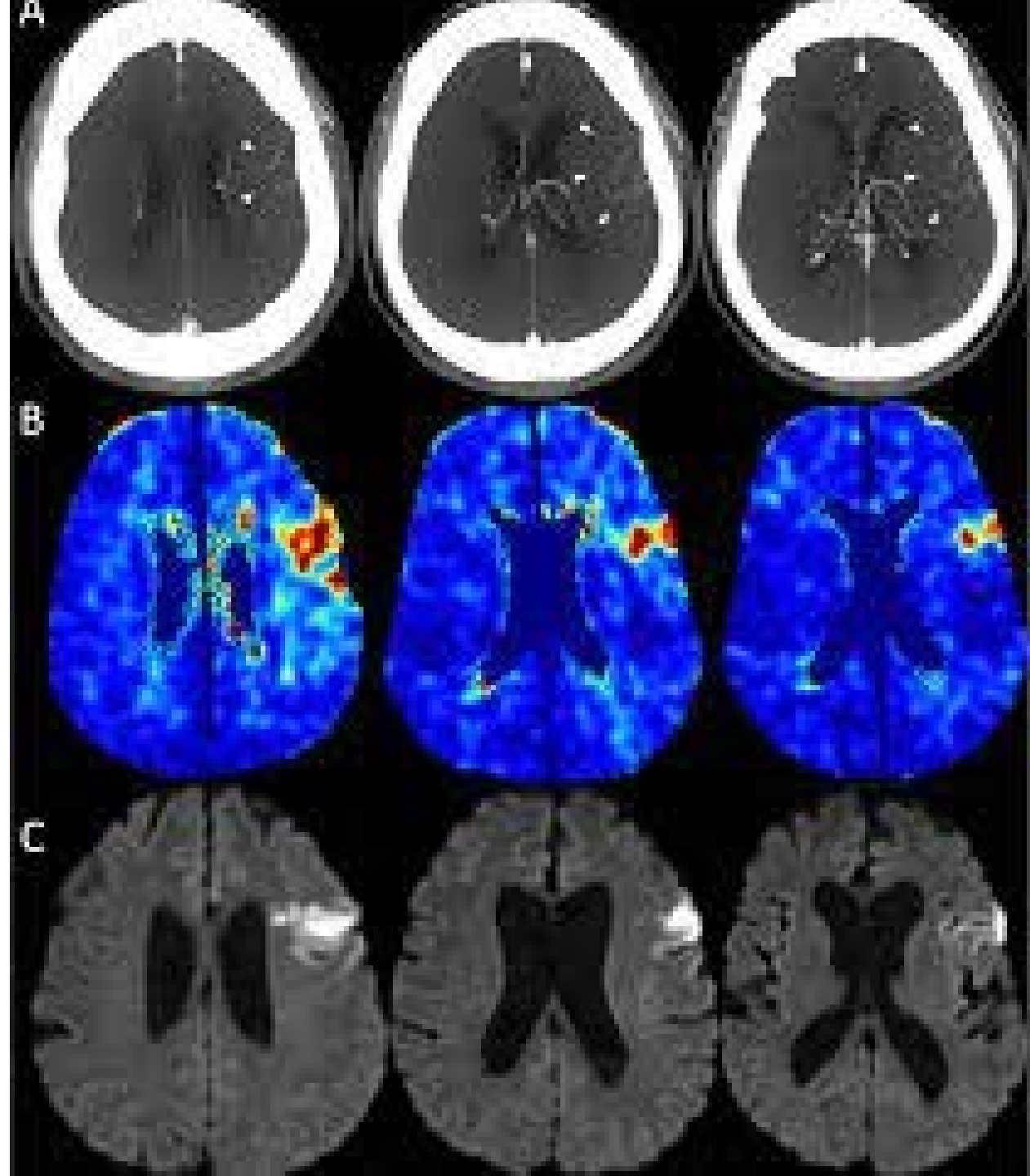


Dominant M2

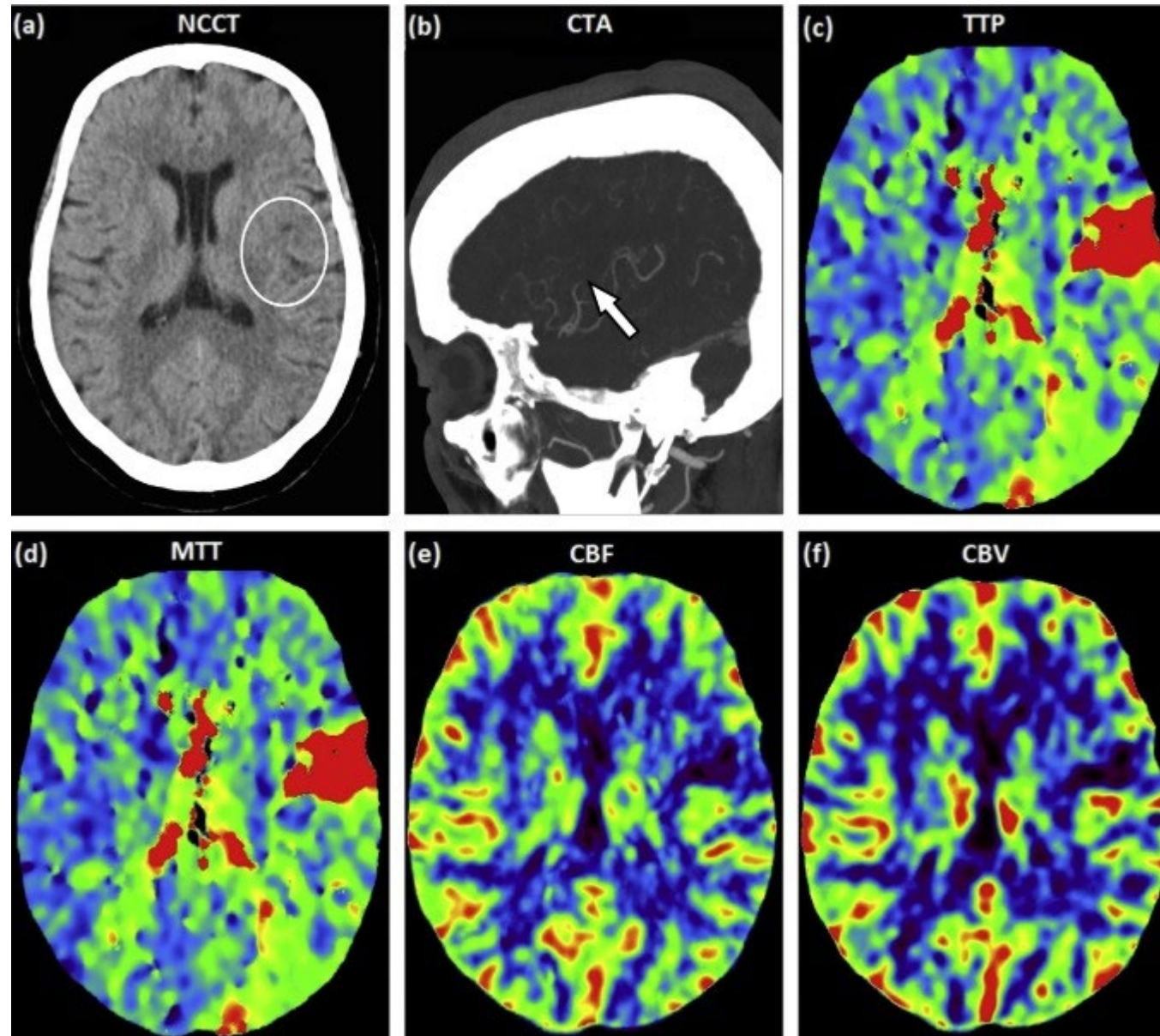
Proximal M3



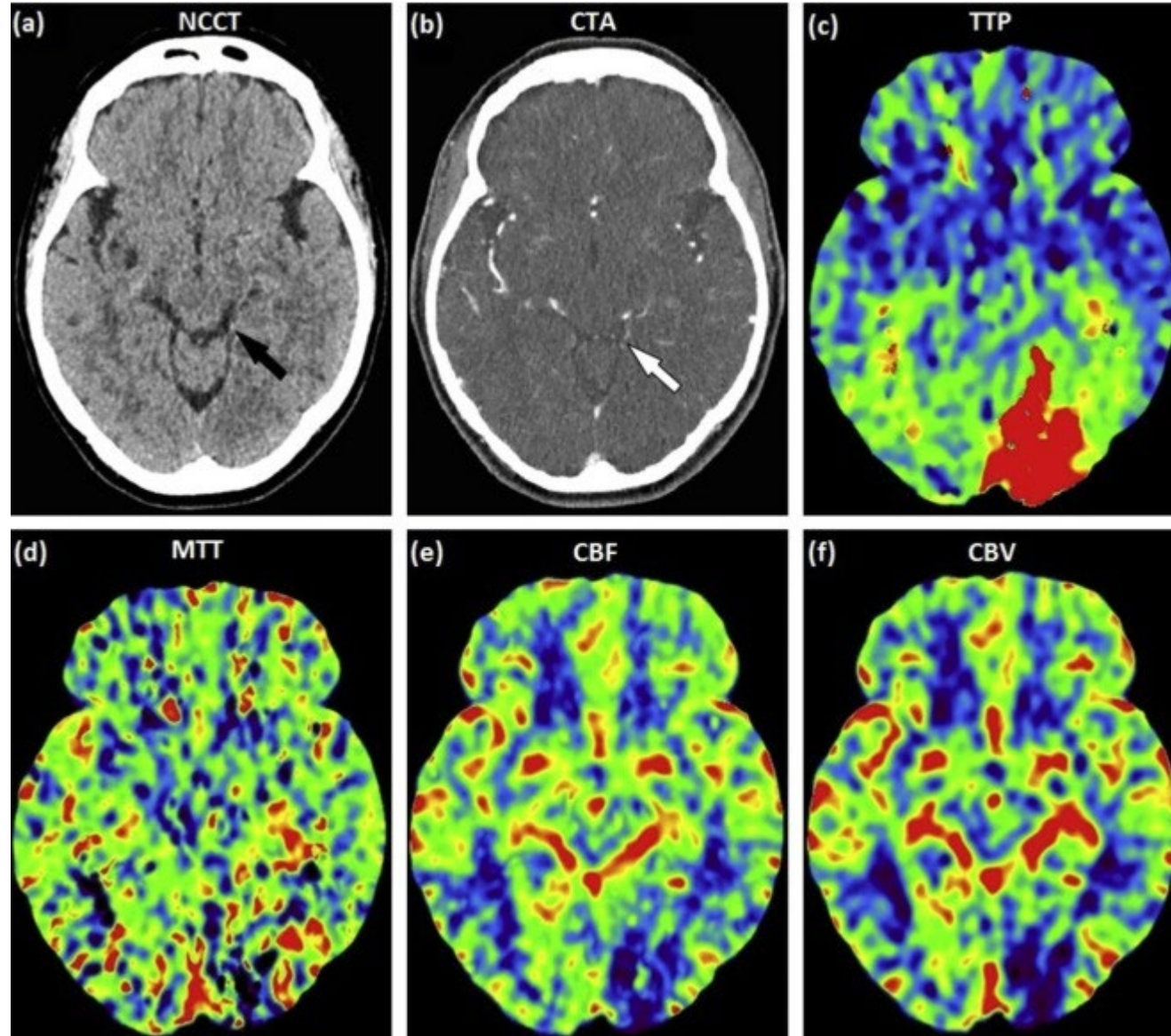
Distal M3

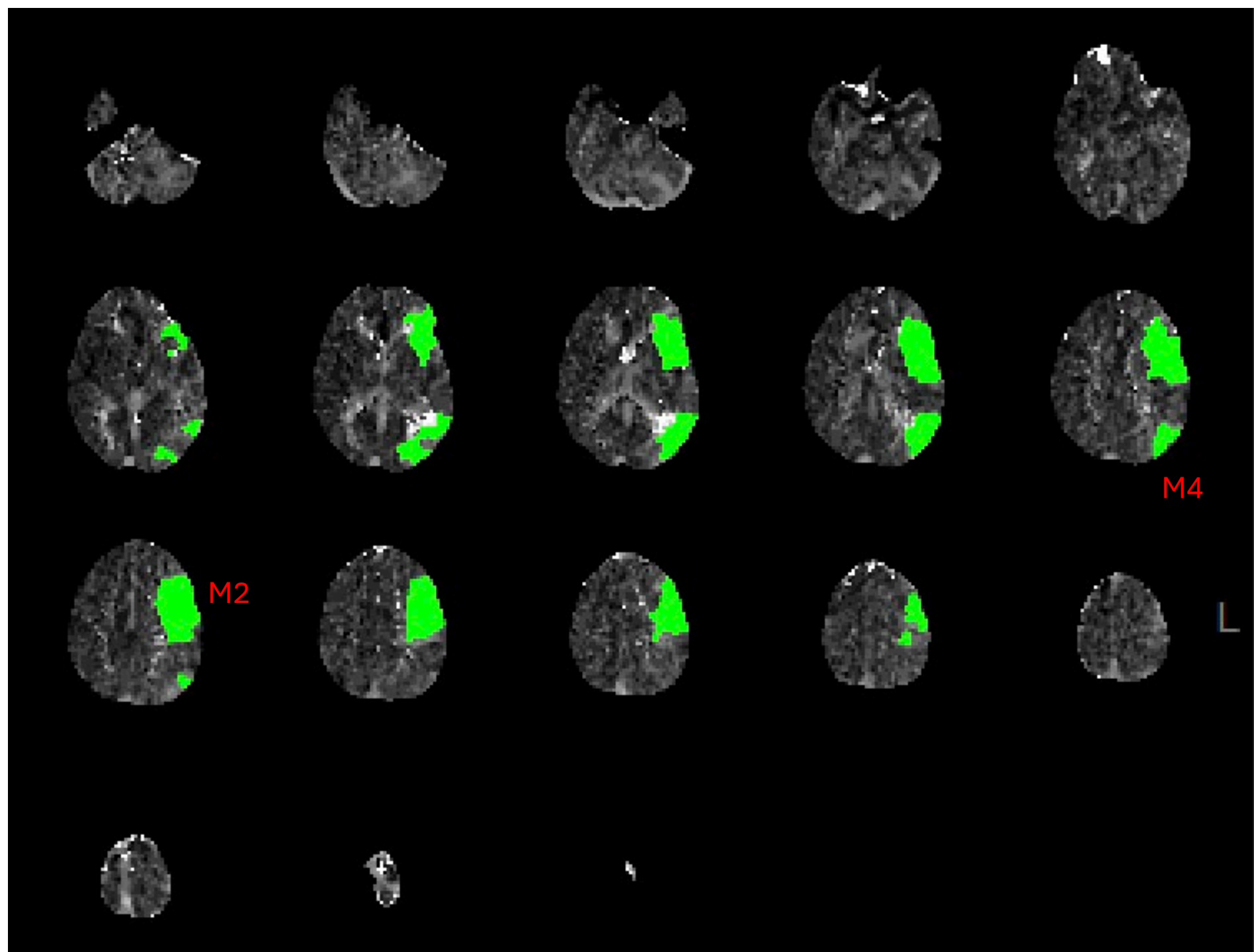


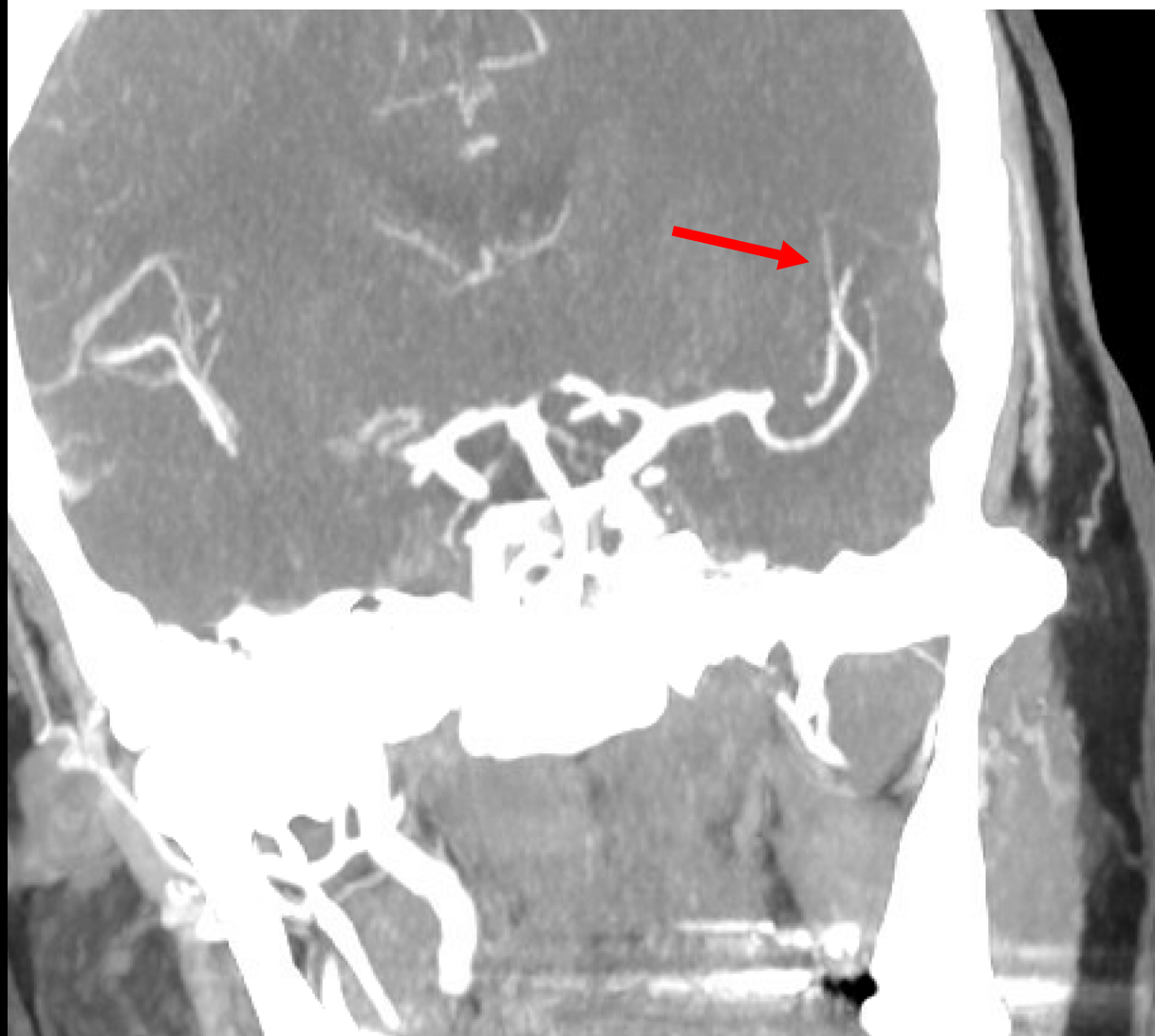
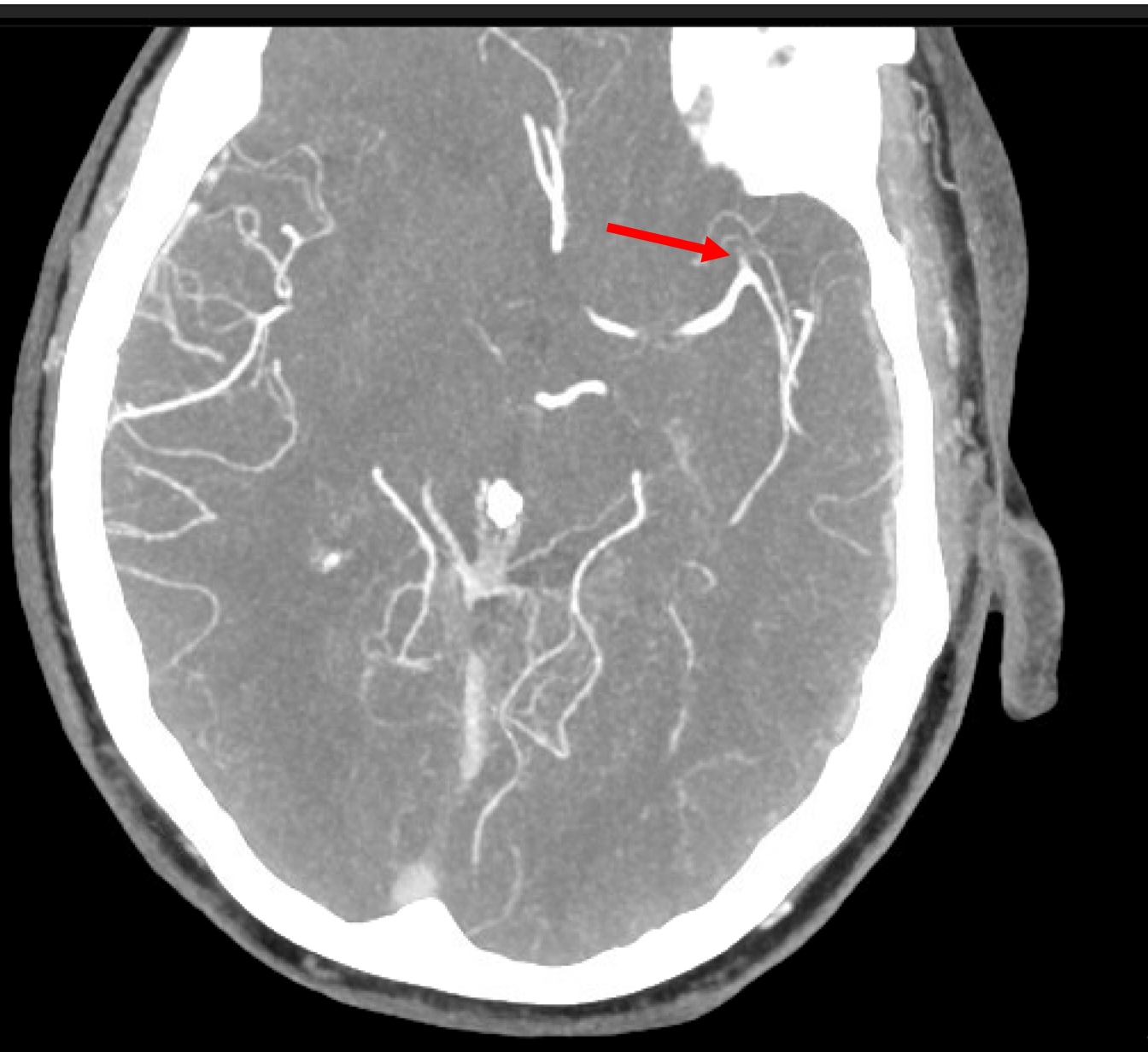
Distal M3



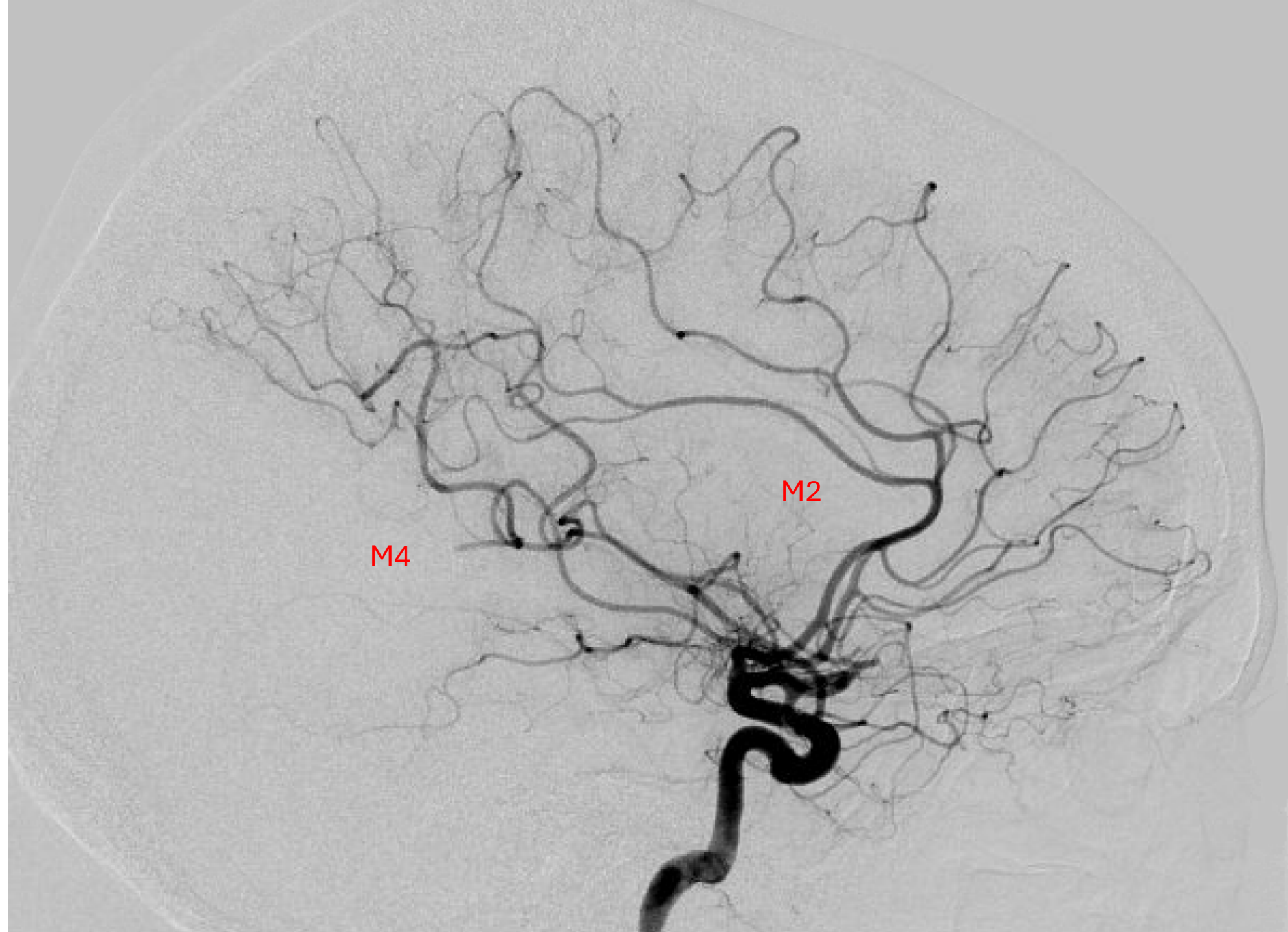
P3

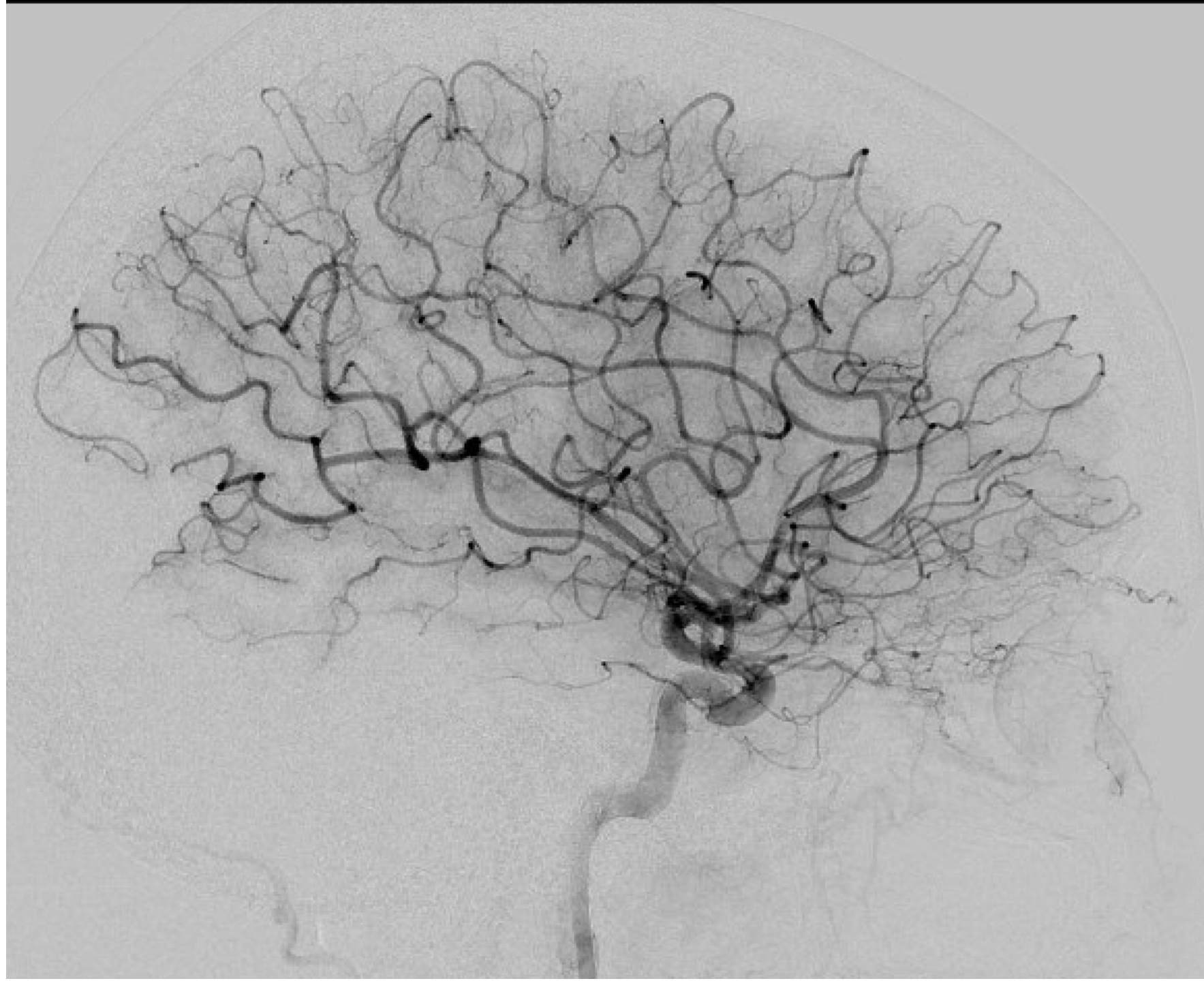


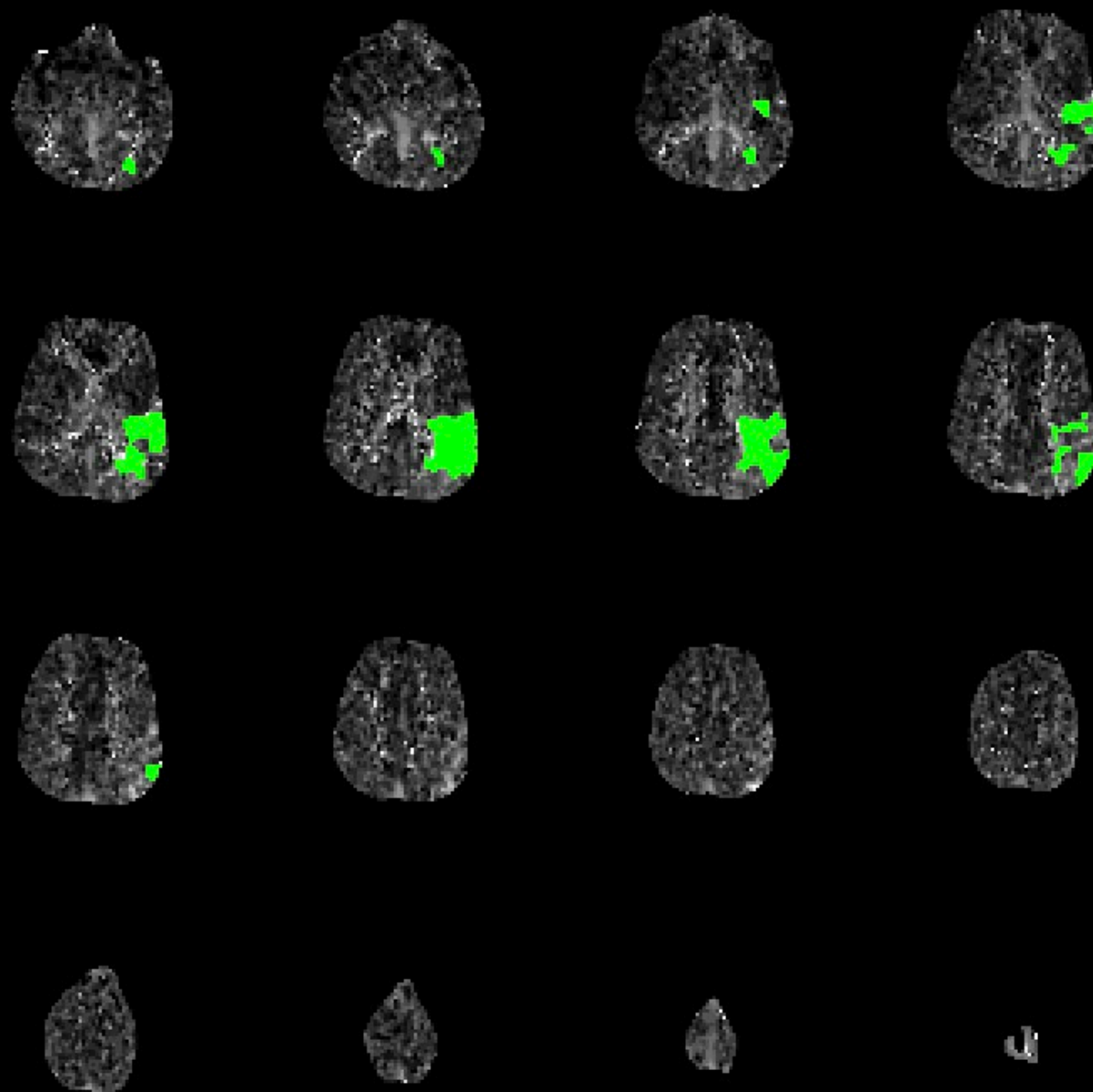








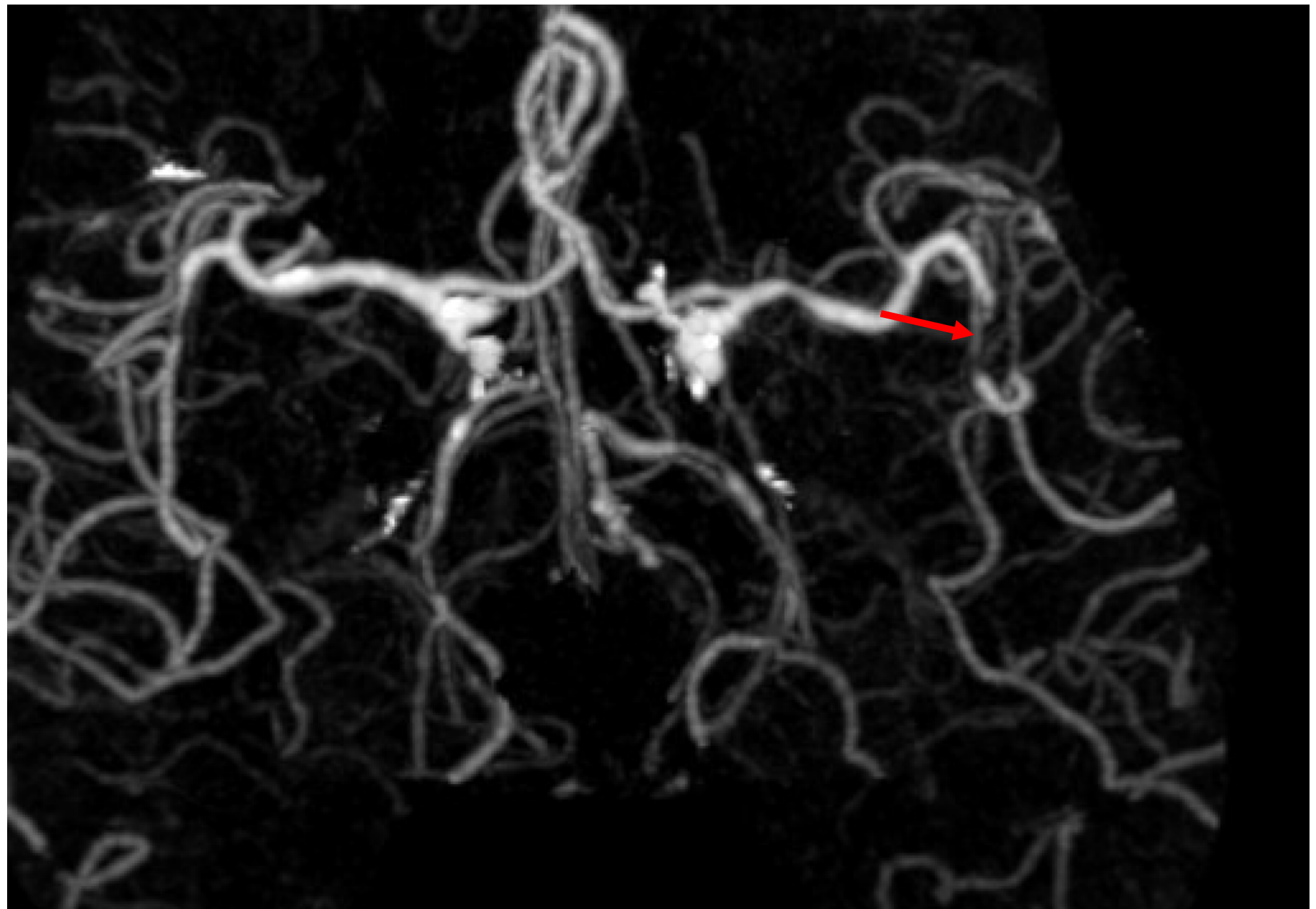


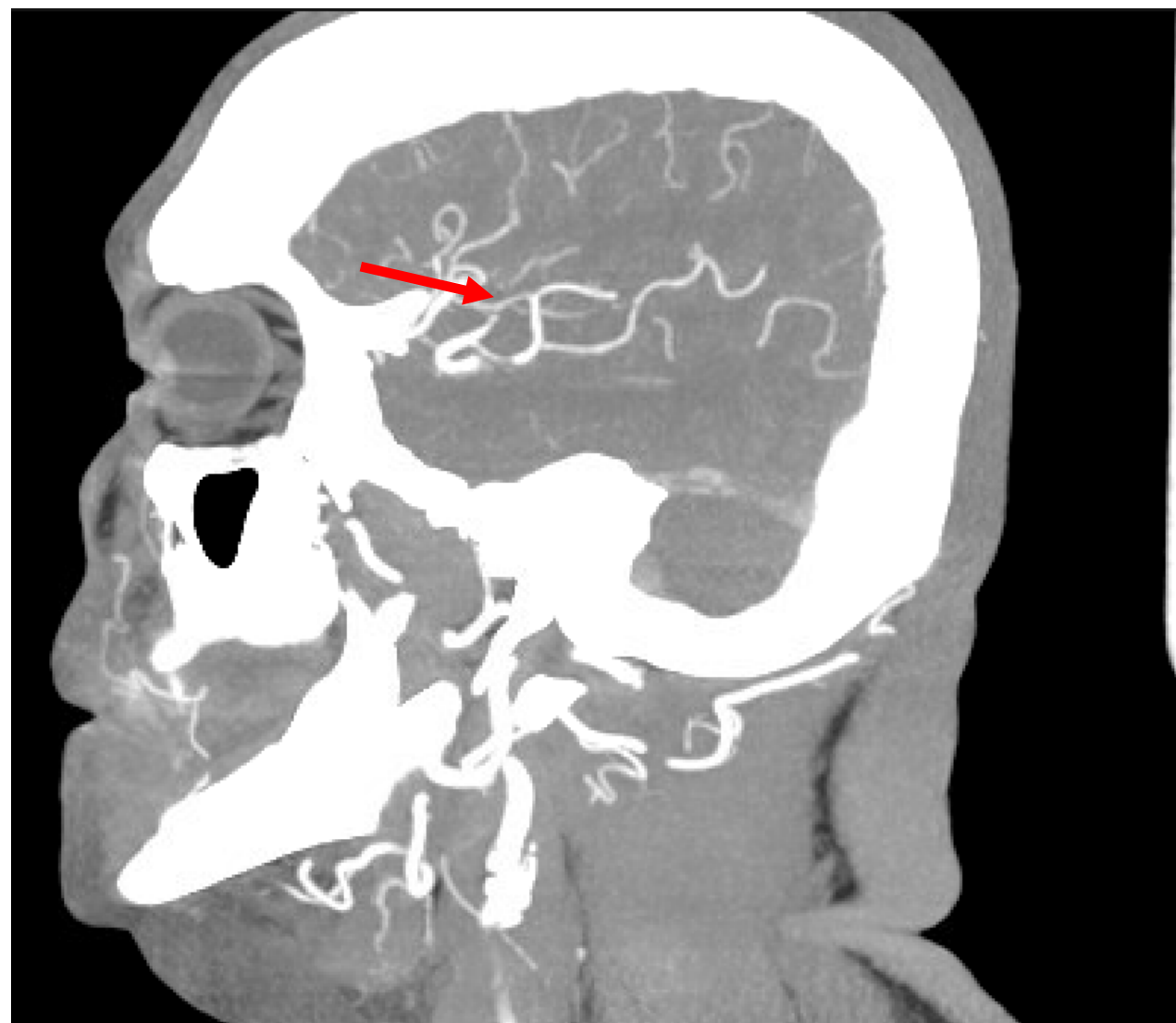
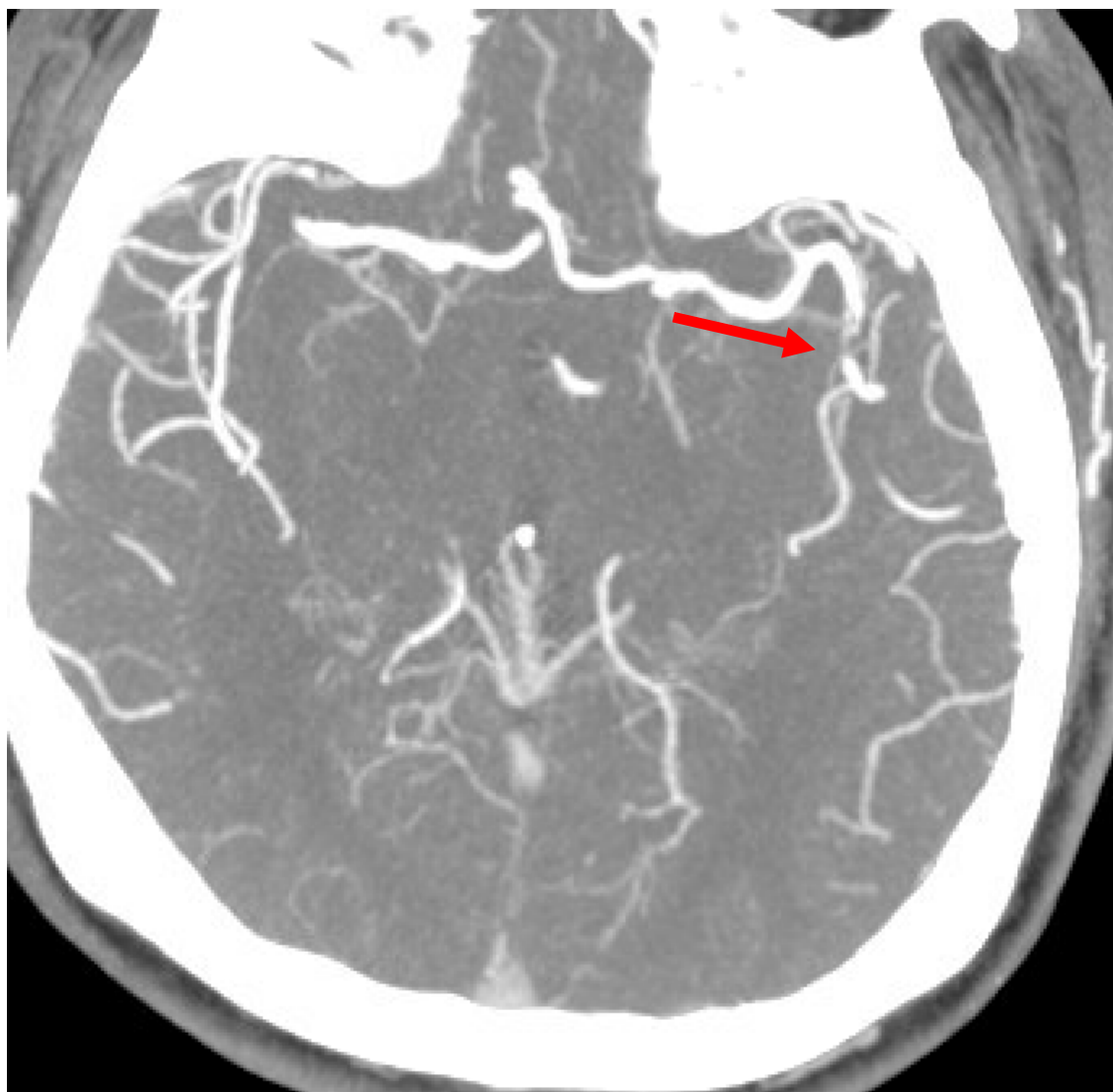


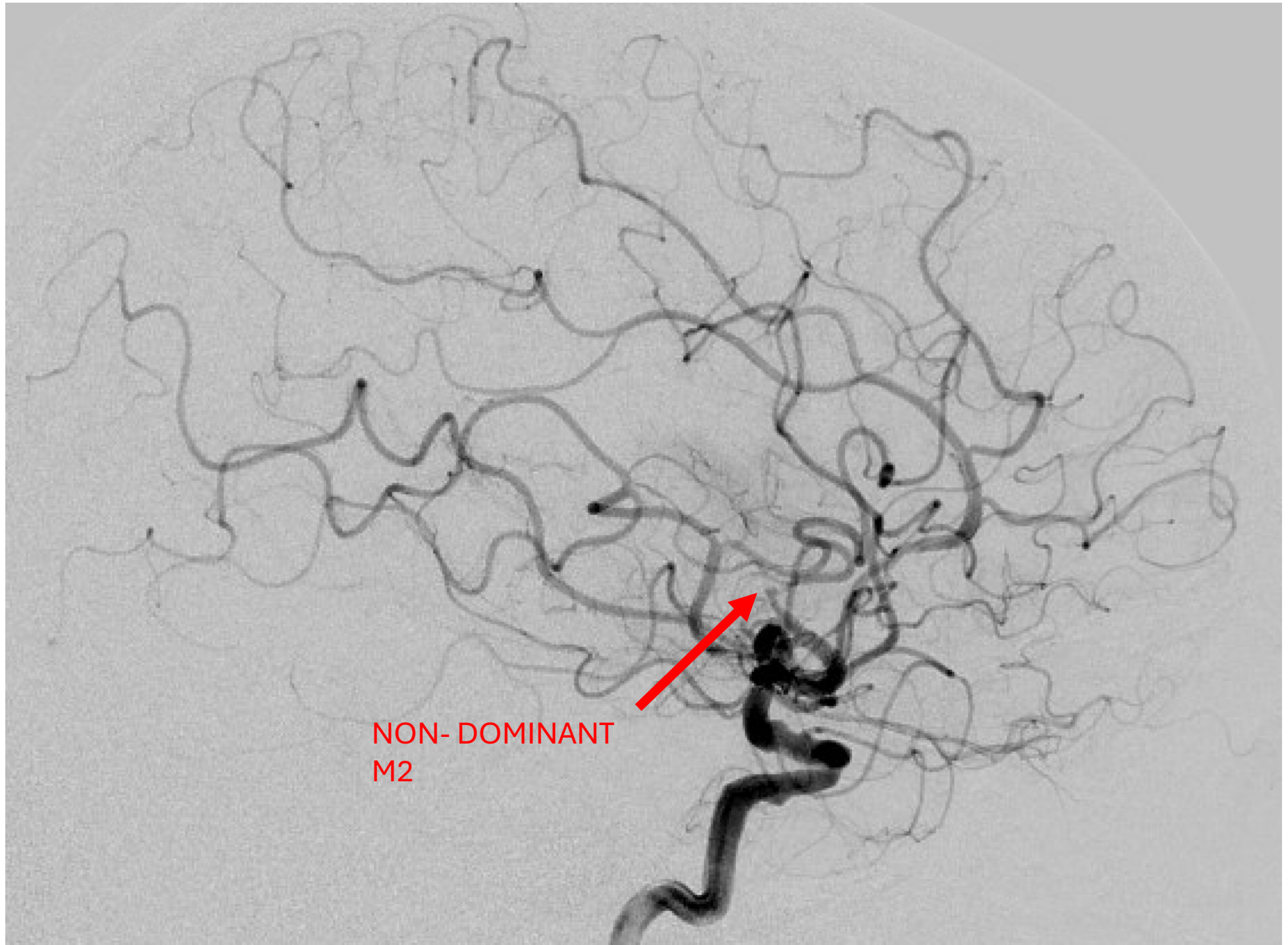
NON-DOMINANT
M2

● Tmax>6.0s: 32 ml

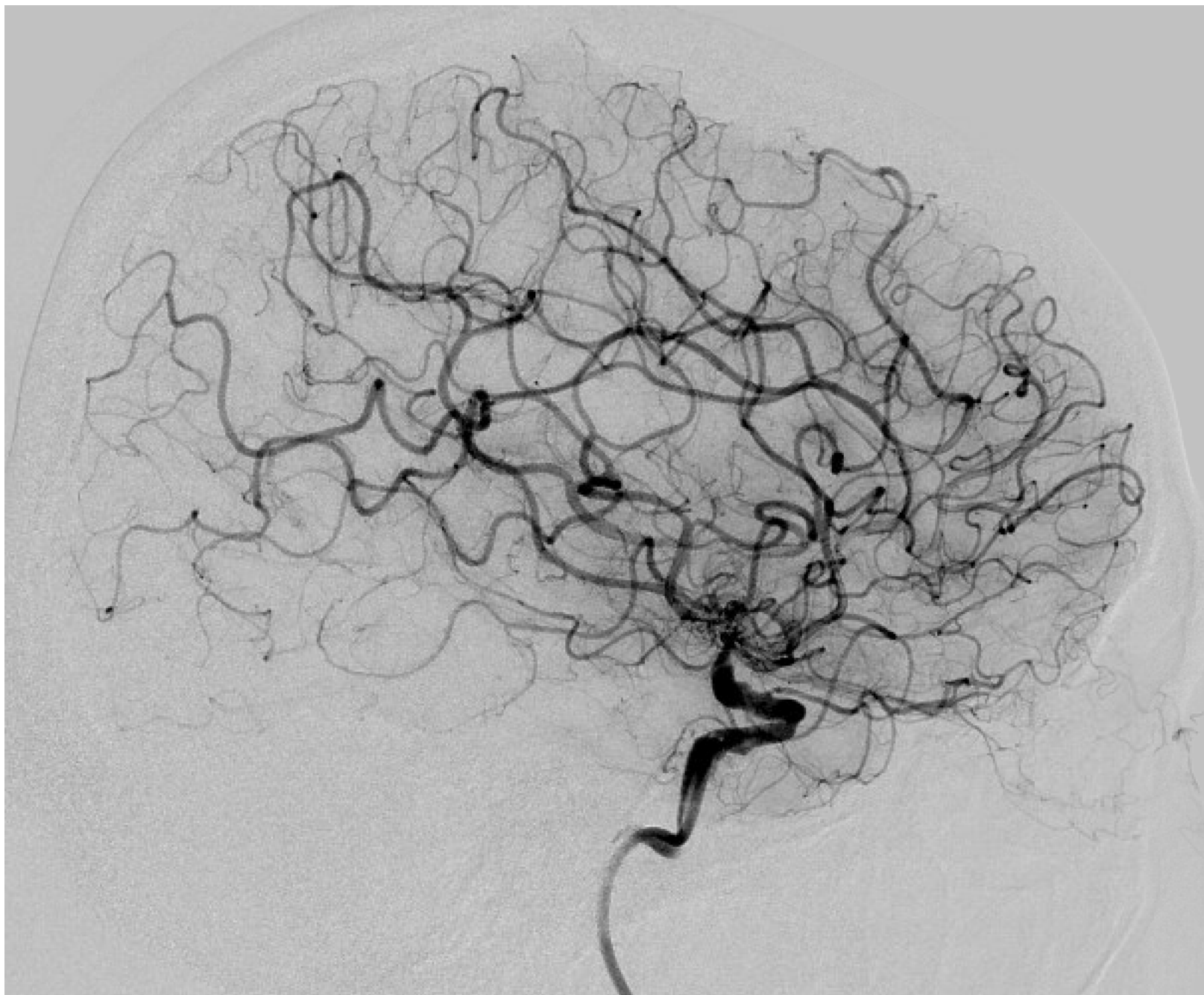
volume: 32 ml

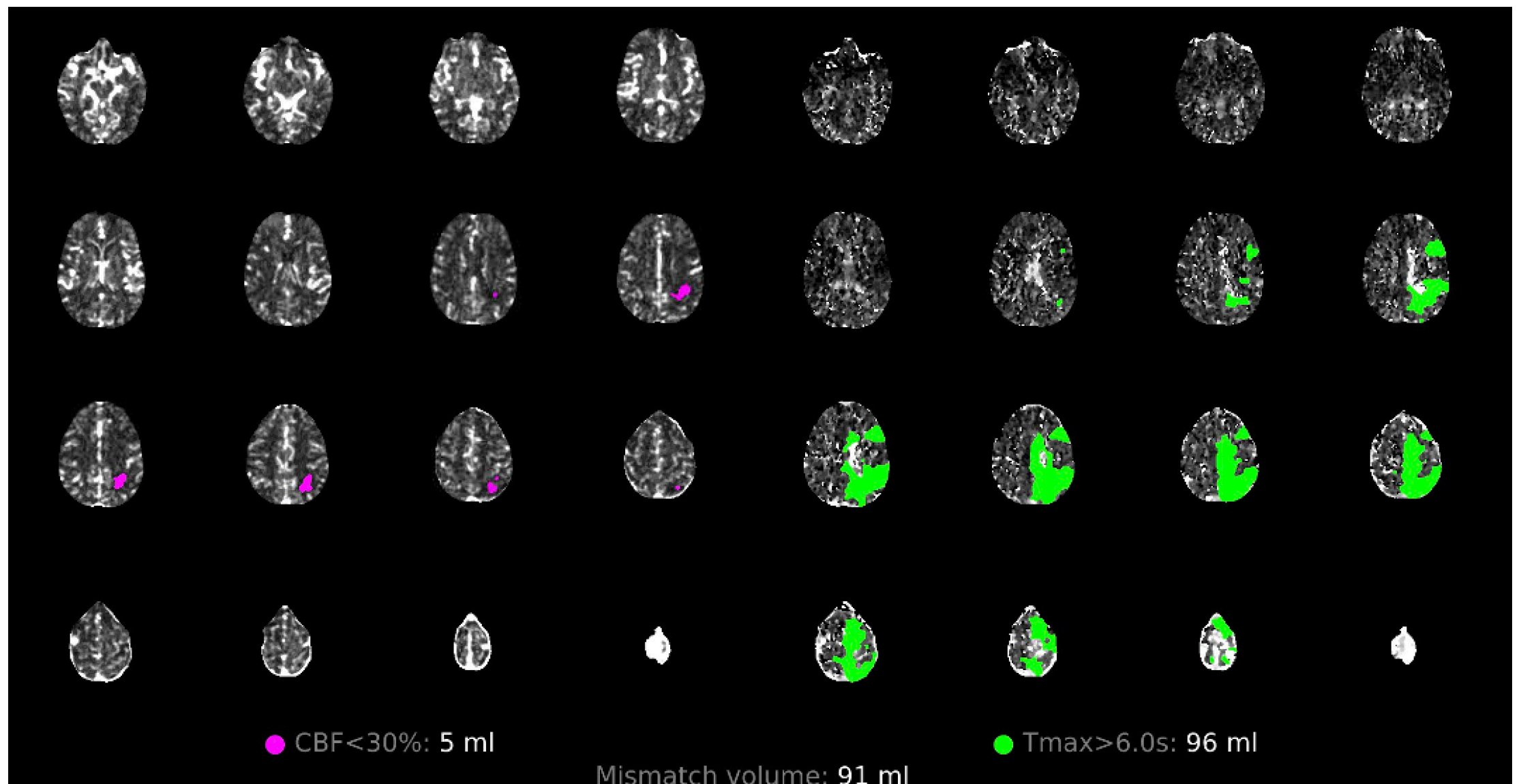




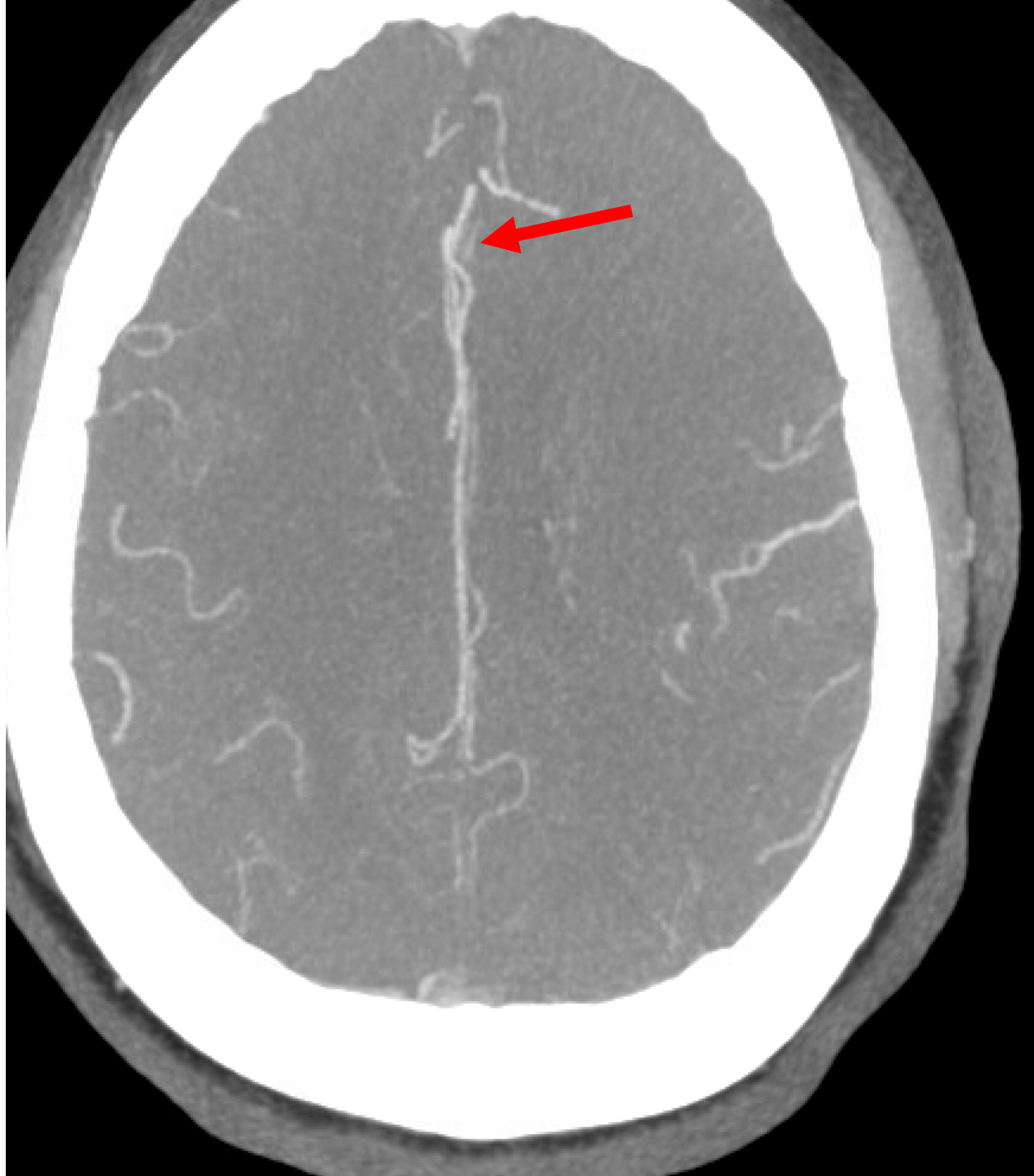


NON- DOMINANT
M2



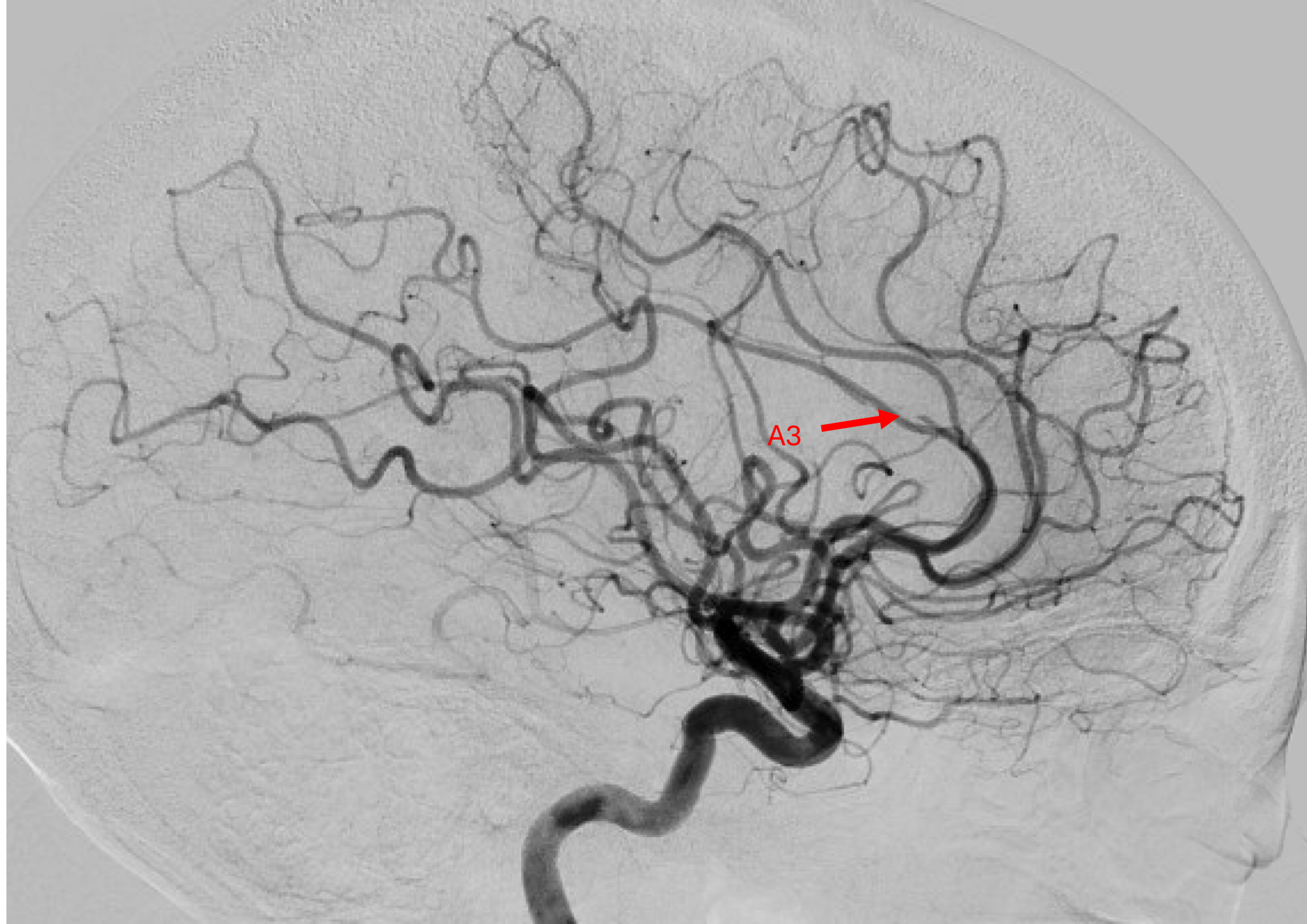


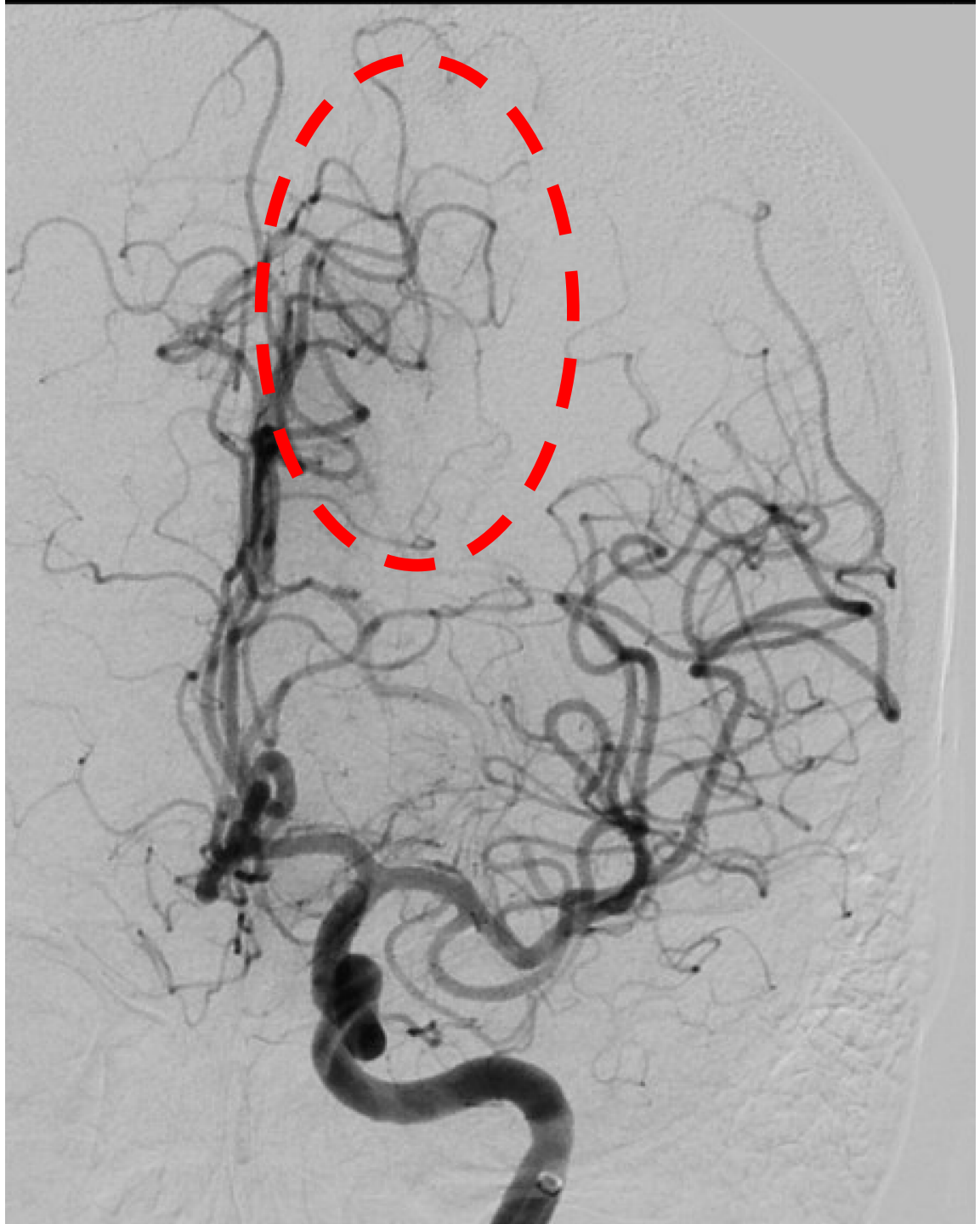
A3 ACA (and M4)

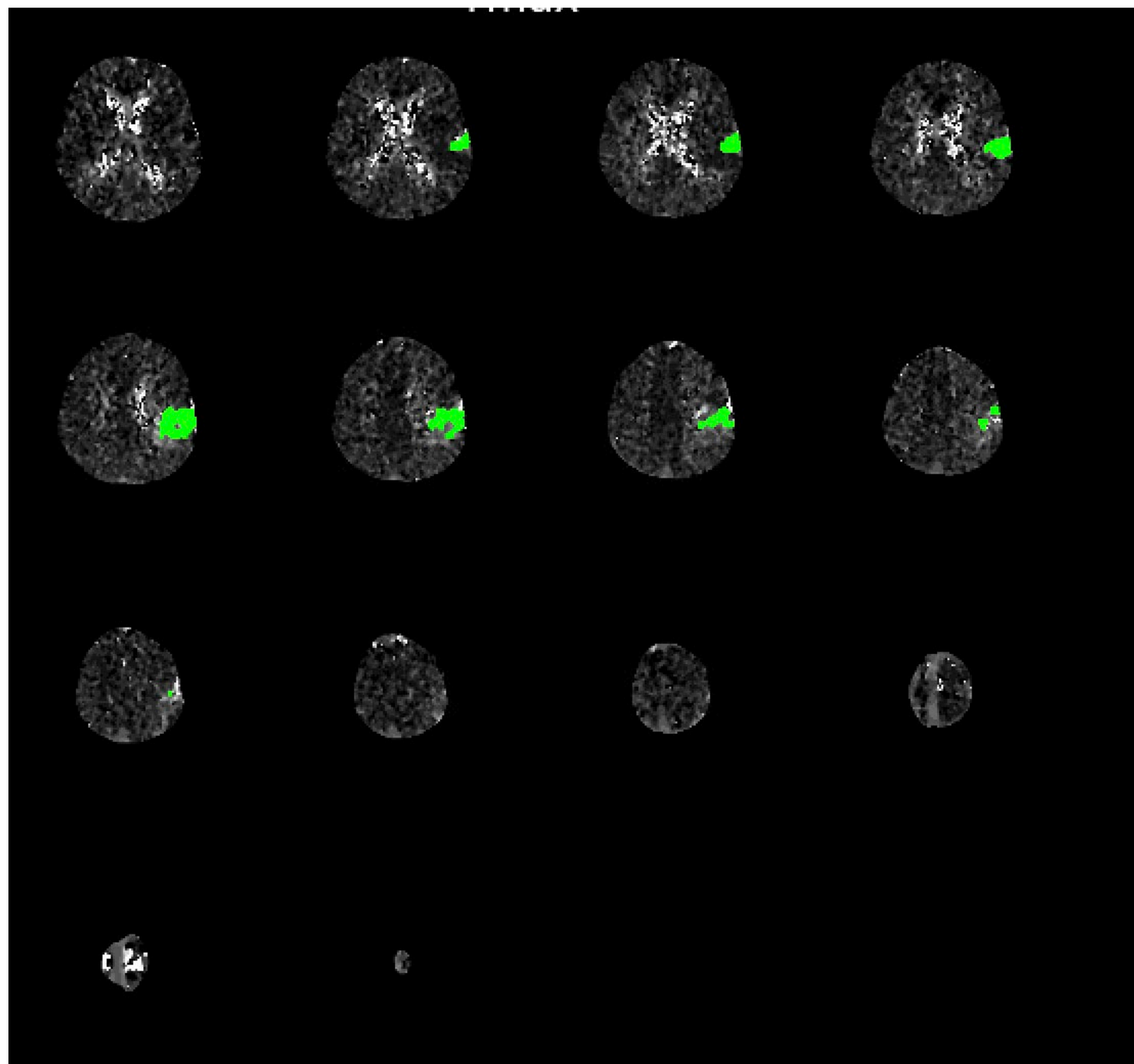


A3 ACA



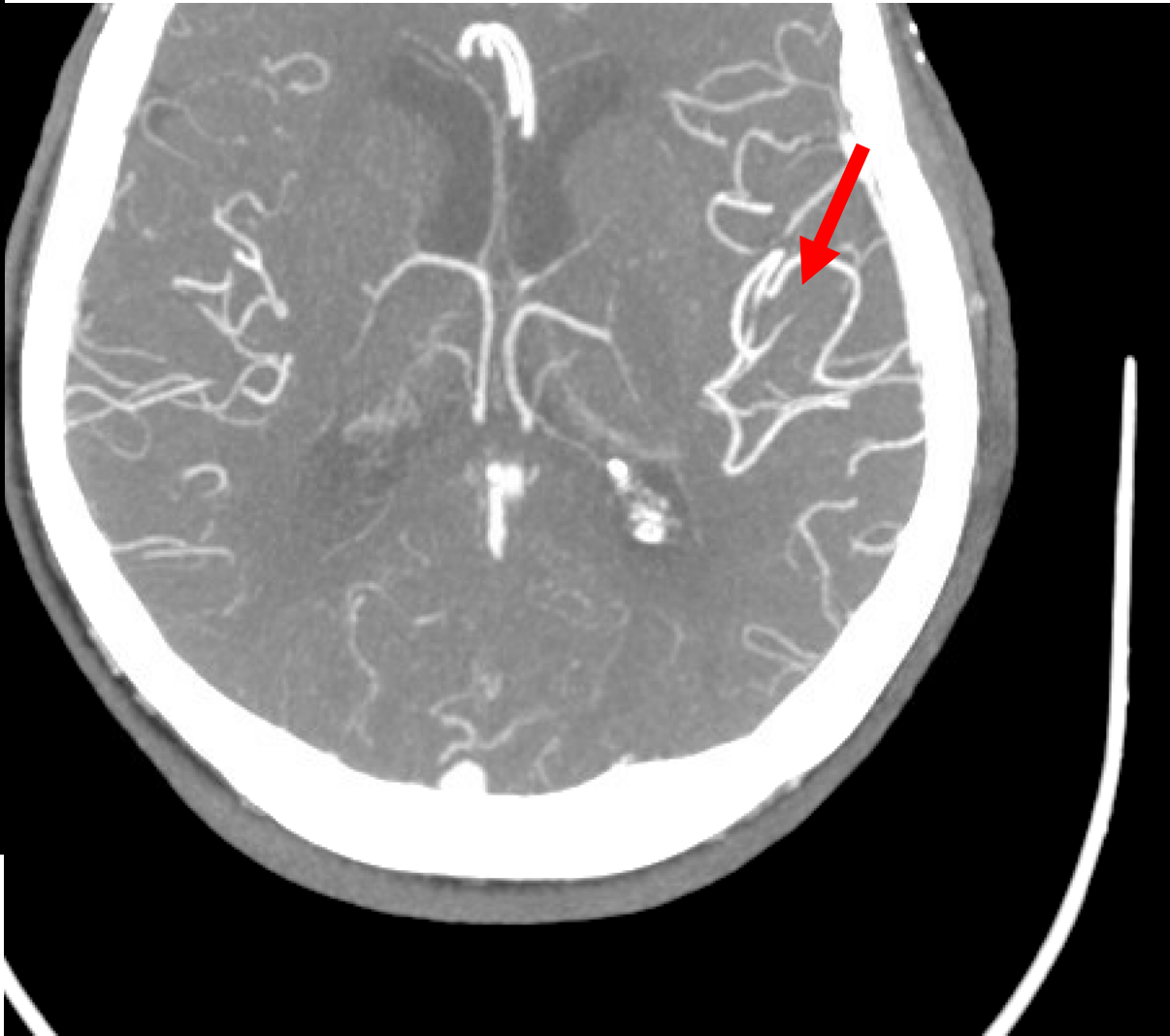
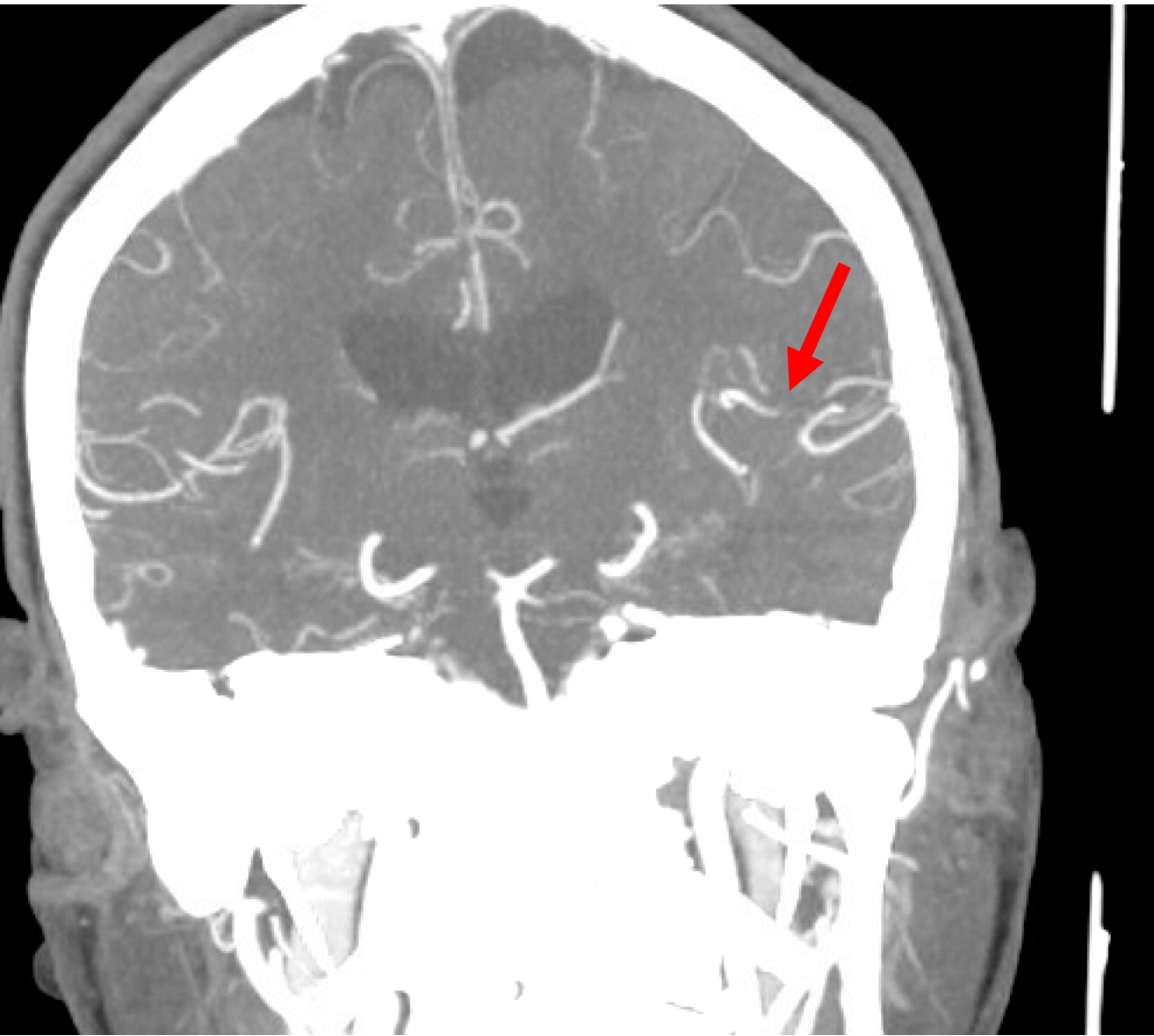






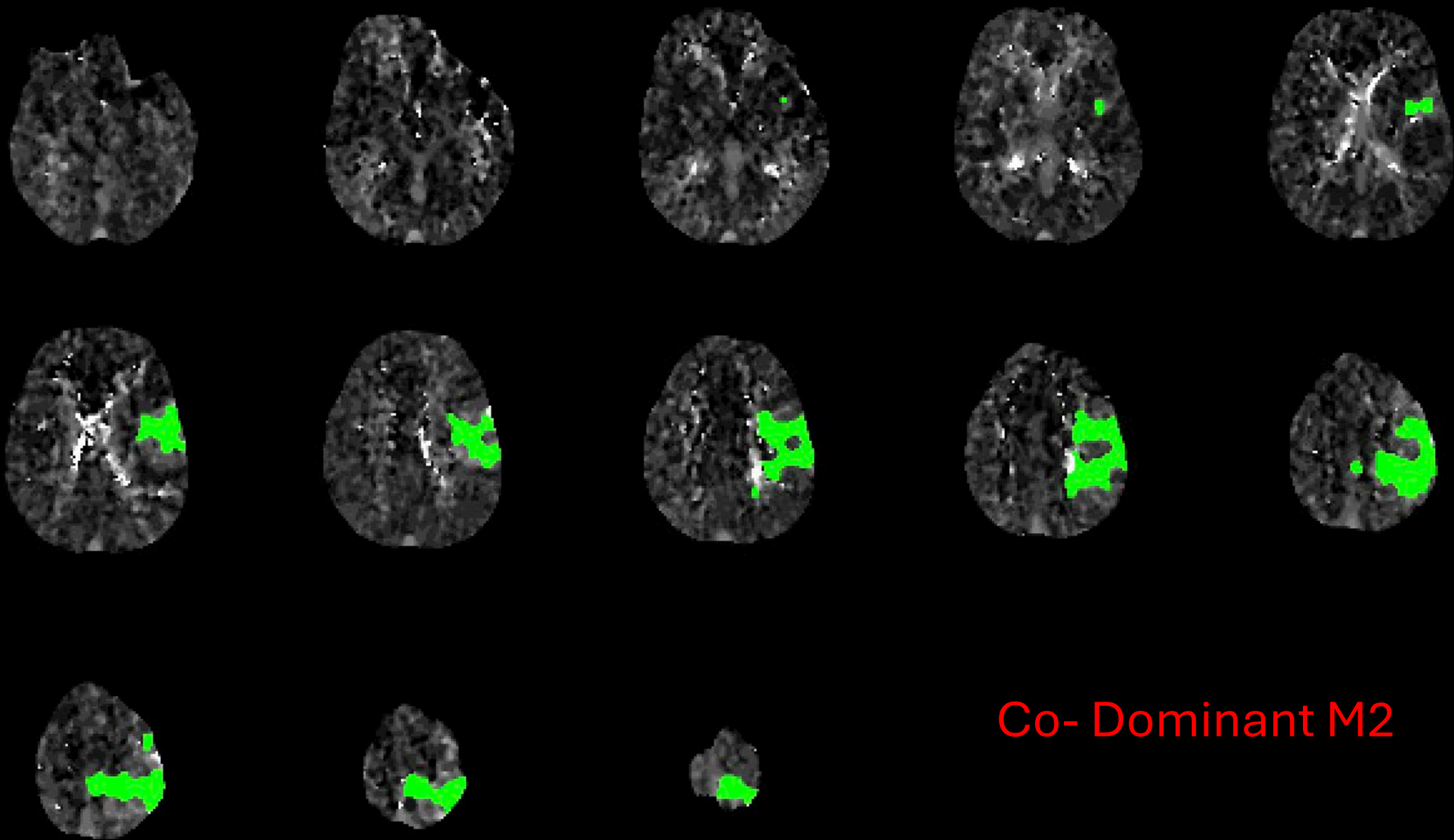
M3

M3



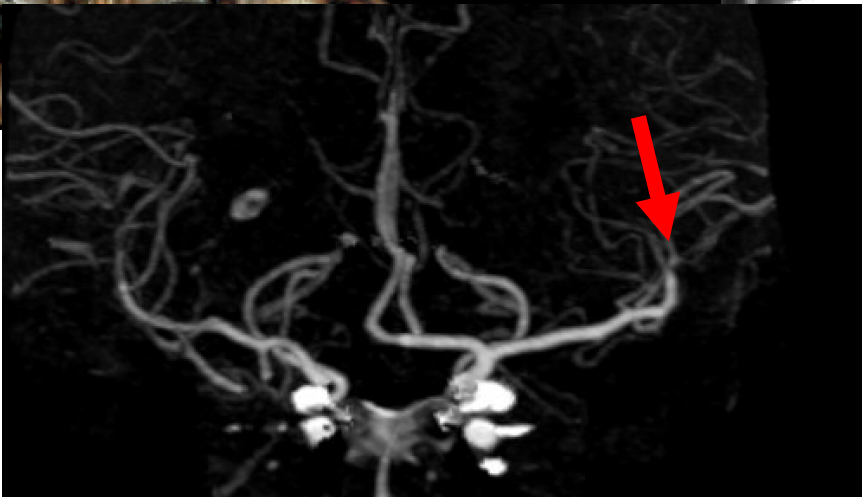
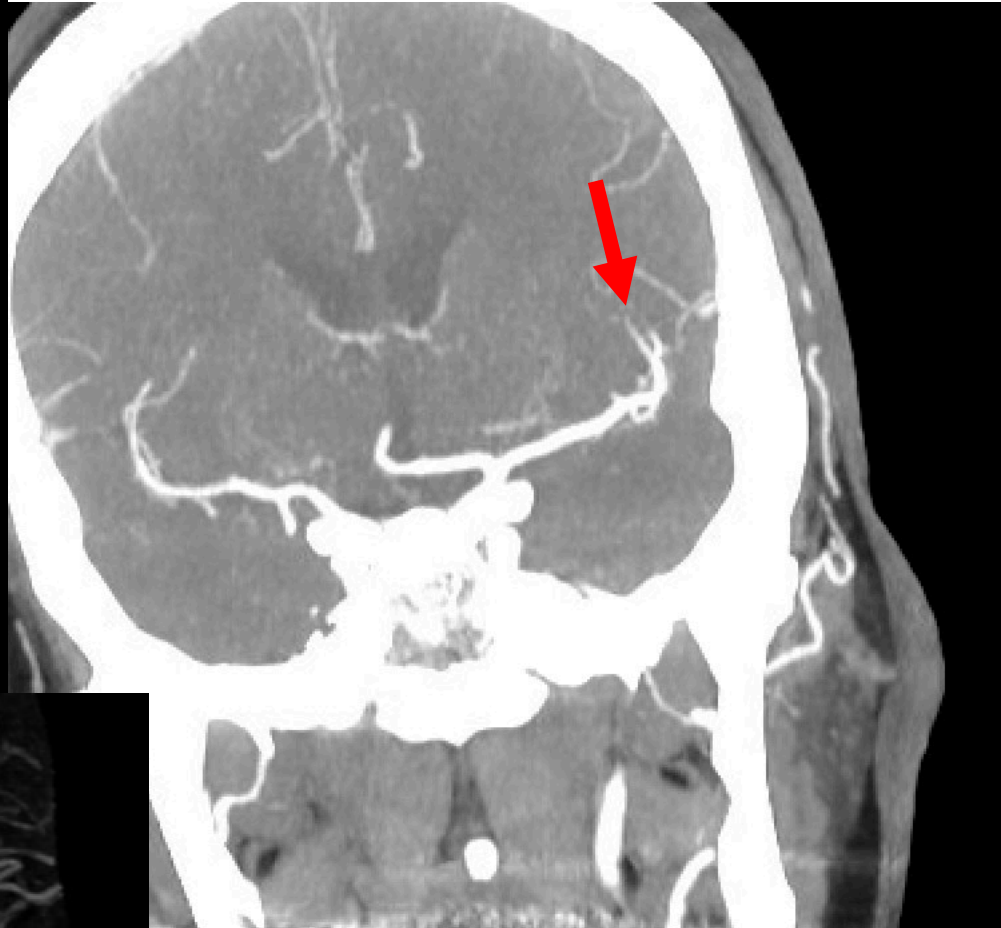
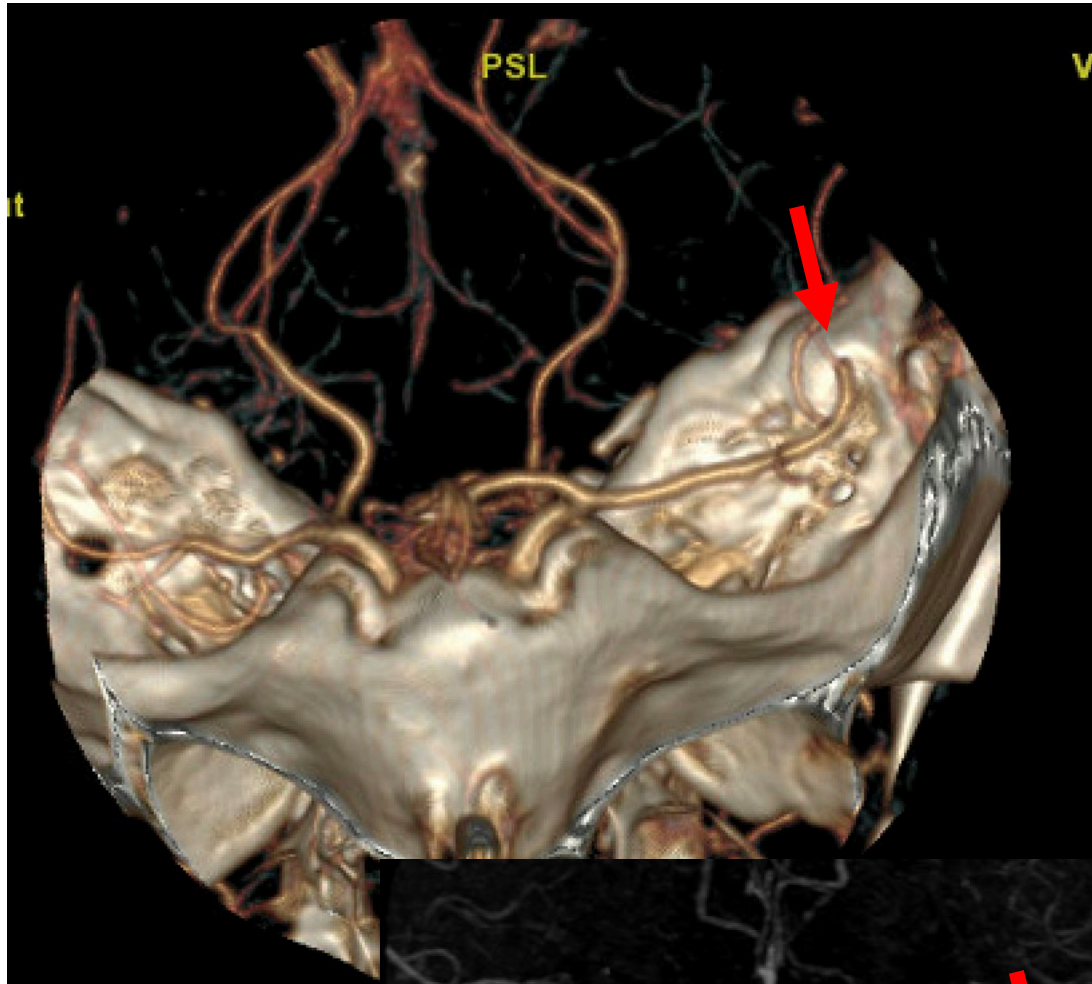


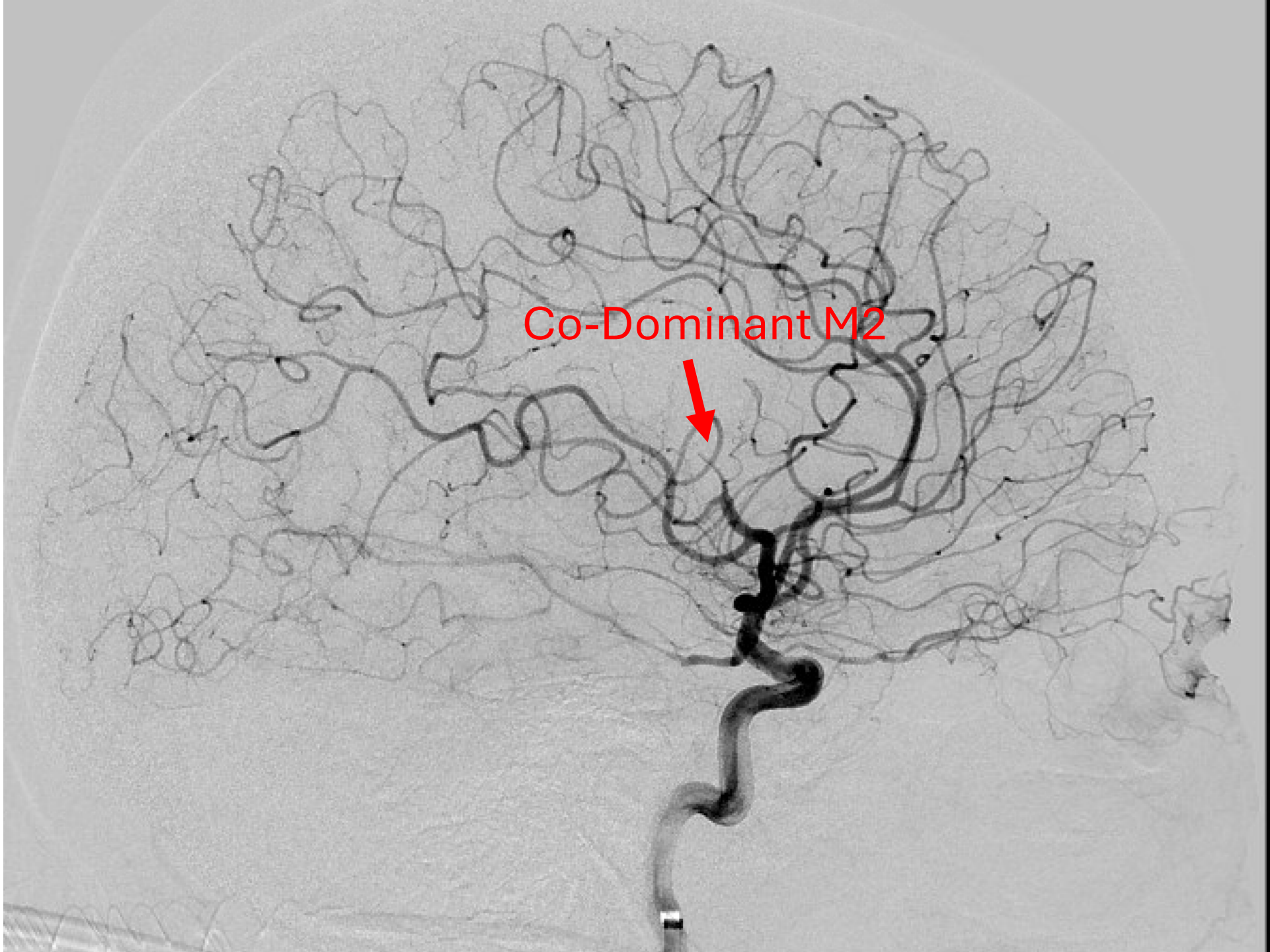
M3



Co- Dominant M2

Co-dominant M2





Co-Dominant M2

