Interventional Neuroradiology, Fondation Rothschild, Paris - France

What to do when it does not want to open?

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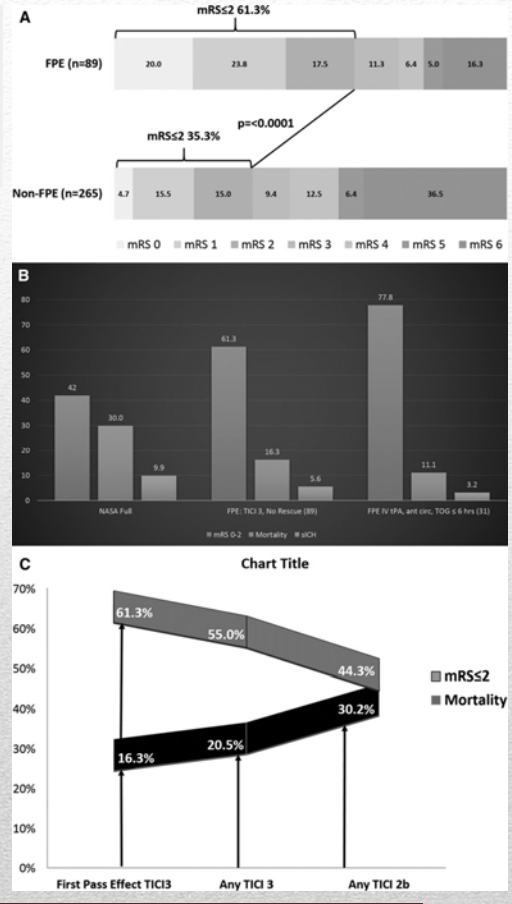
First Pass Effect

A New Measure for Stroke Thrombectomy Devices

FPE subgroup within the NASA registry using the following 3 criteria:

- single pass/use of the device,
- complete revascularization of the LVO and its downstream territory (mTICI 2C/3),
- no use of rescue therapy

Complete revascularization from a single thrombectomy device pass (FPE) is associated with significantly higher rates of good clinical outcome. The FPE is more frequently associated with the ***use of BGC*** and less likely to be achieved with ICA terminus occlusion.



Osama Zaidat et al. Stroke. 2018;49:660-666

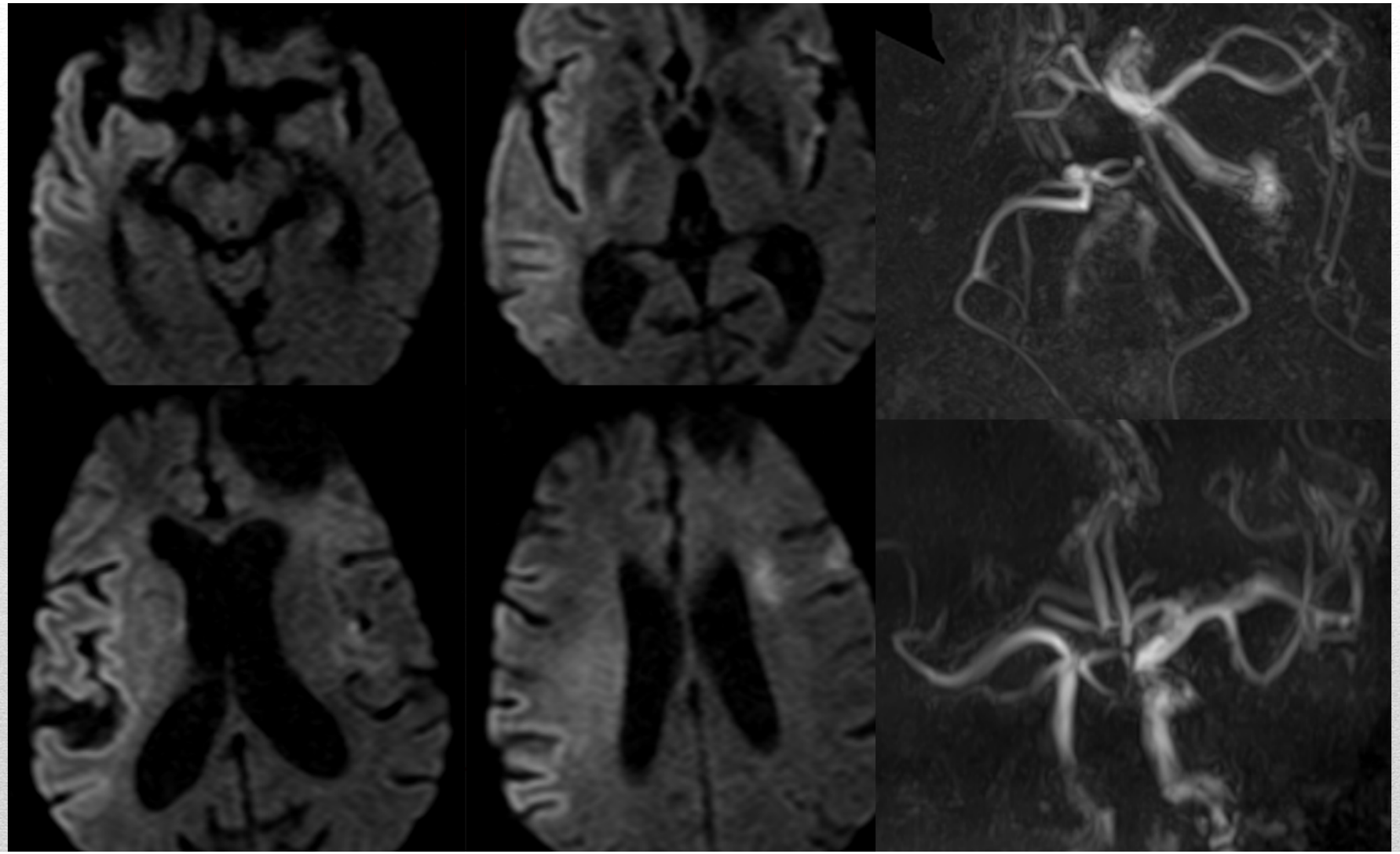
Probably not to engage…

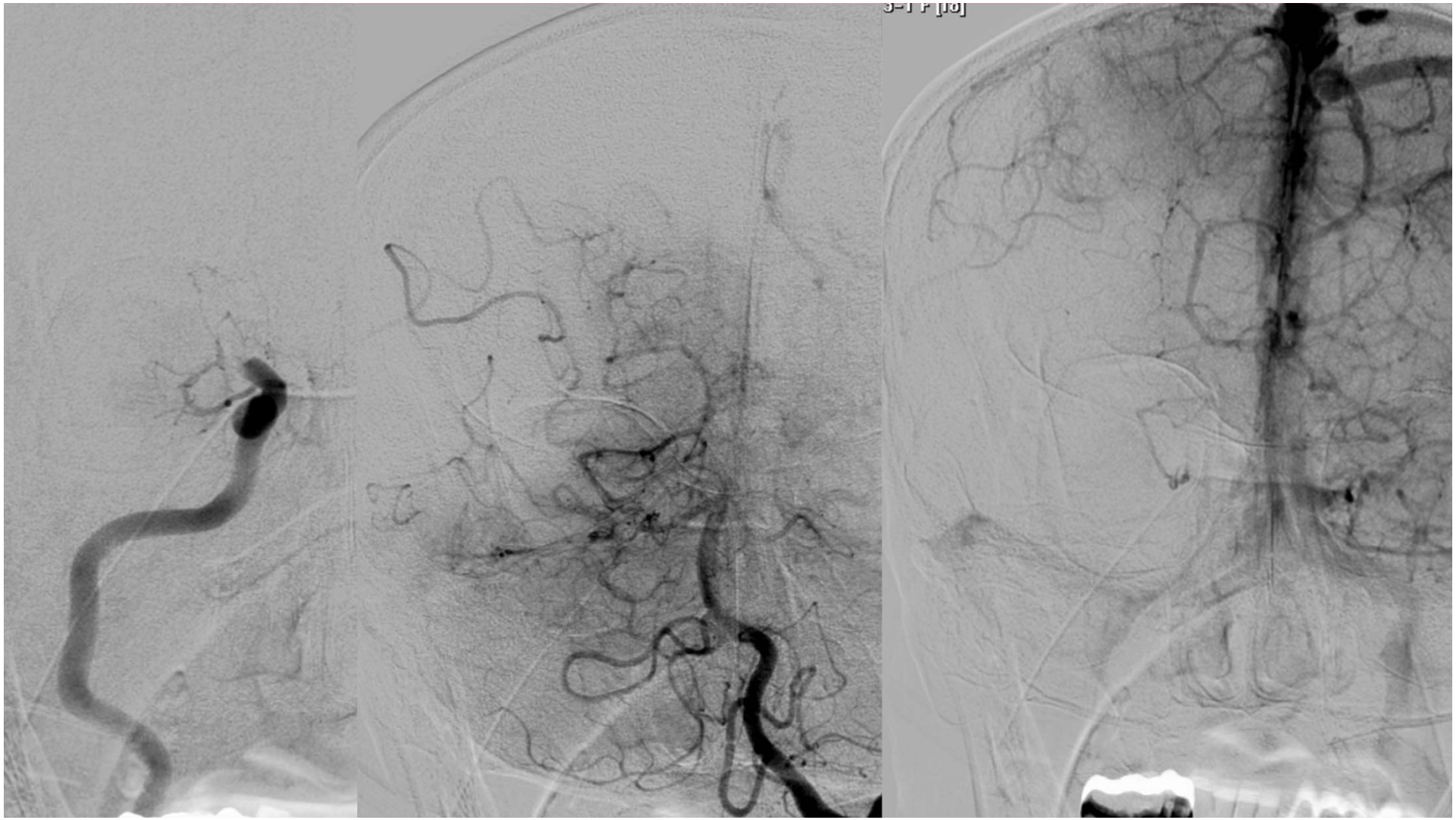
Amaro Francis

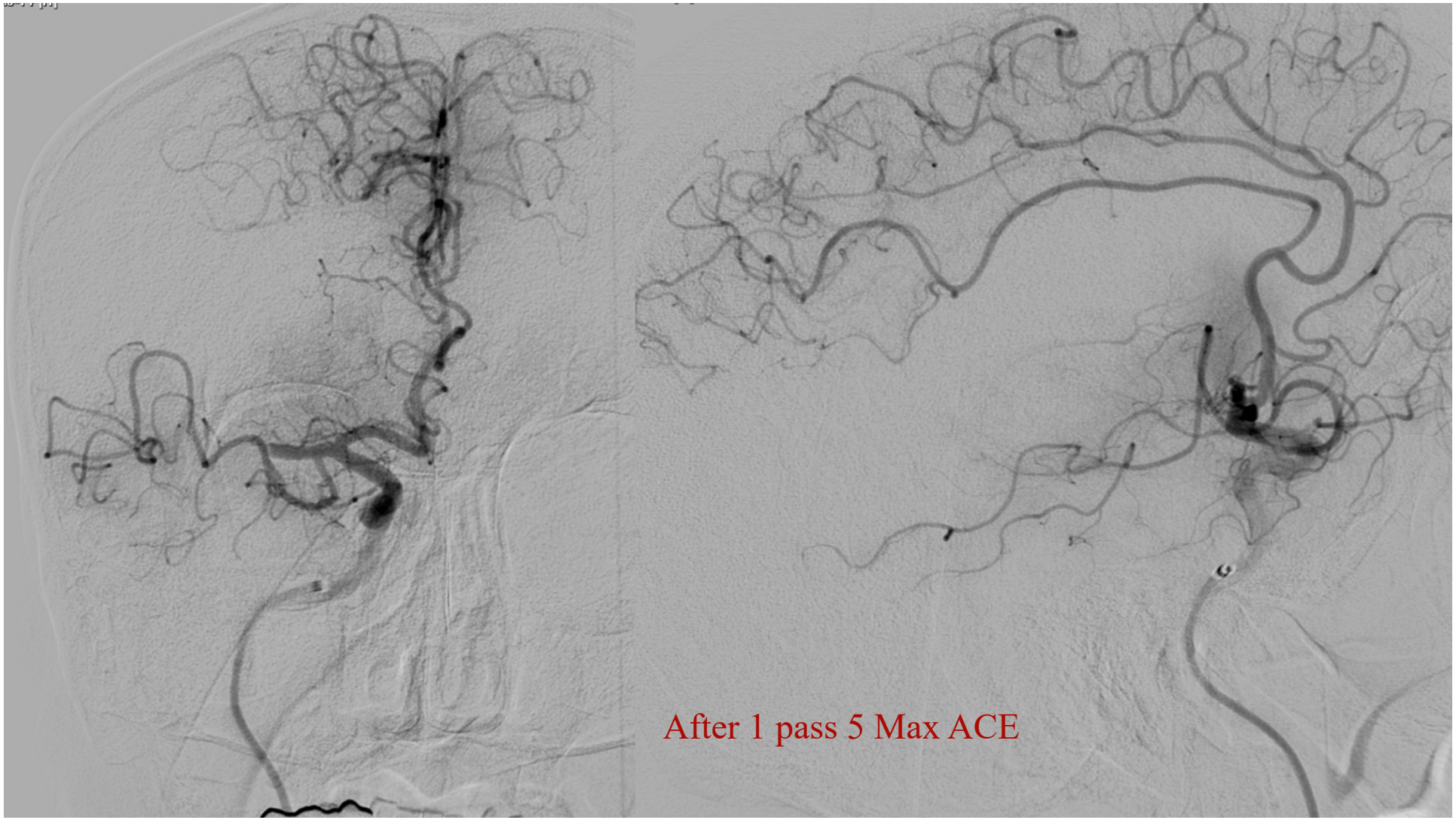
18/02/2015

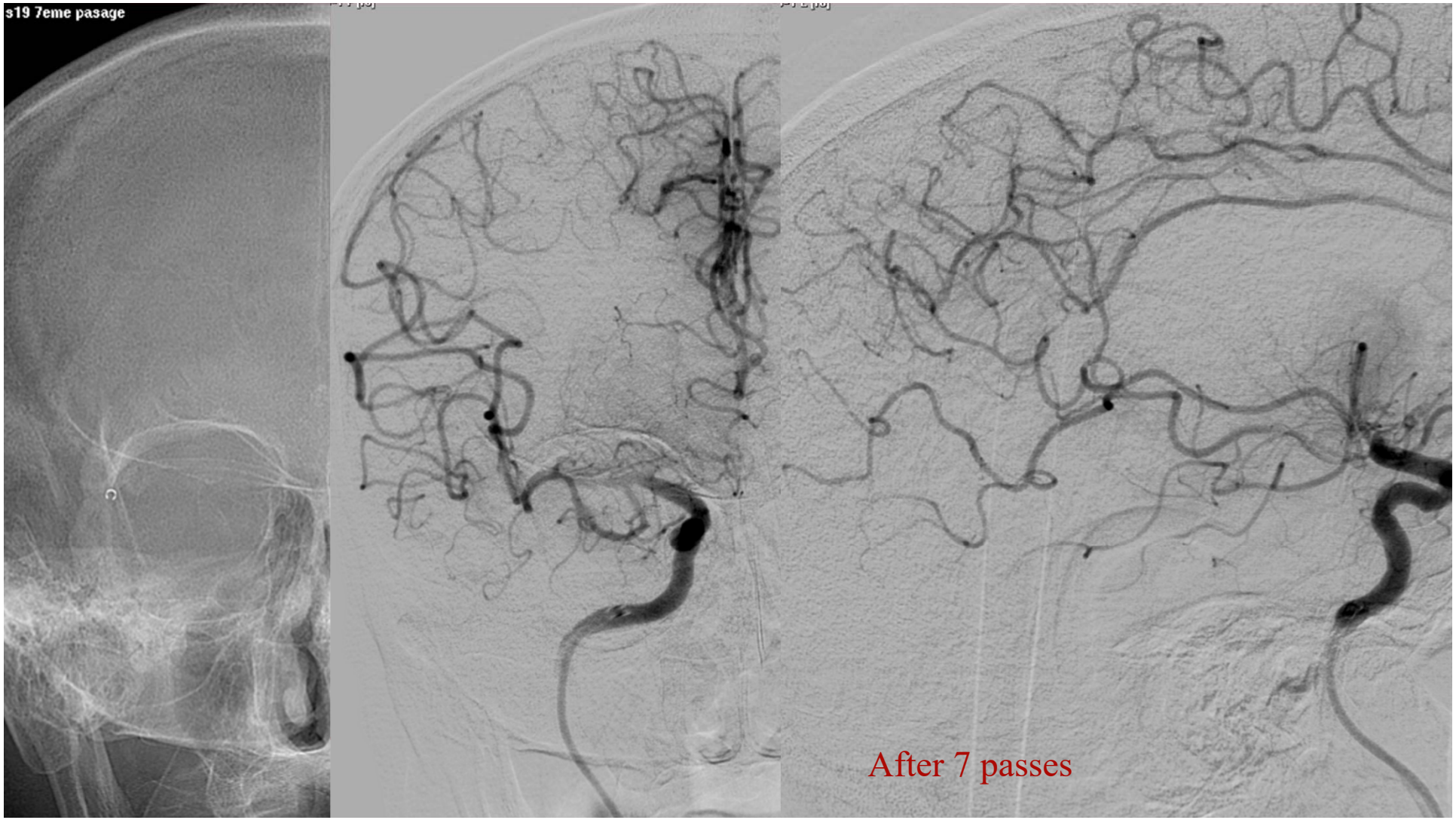
Metrics

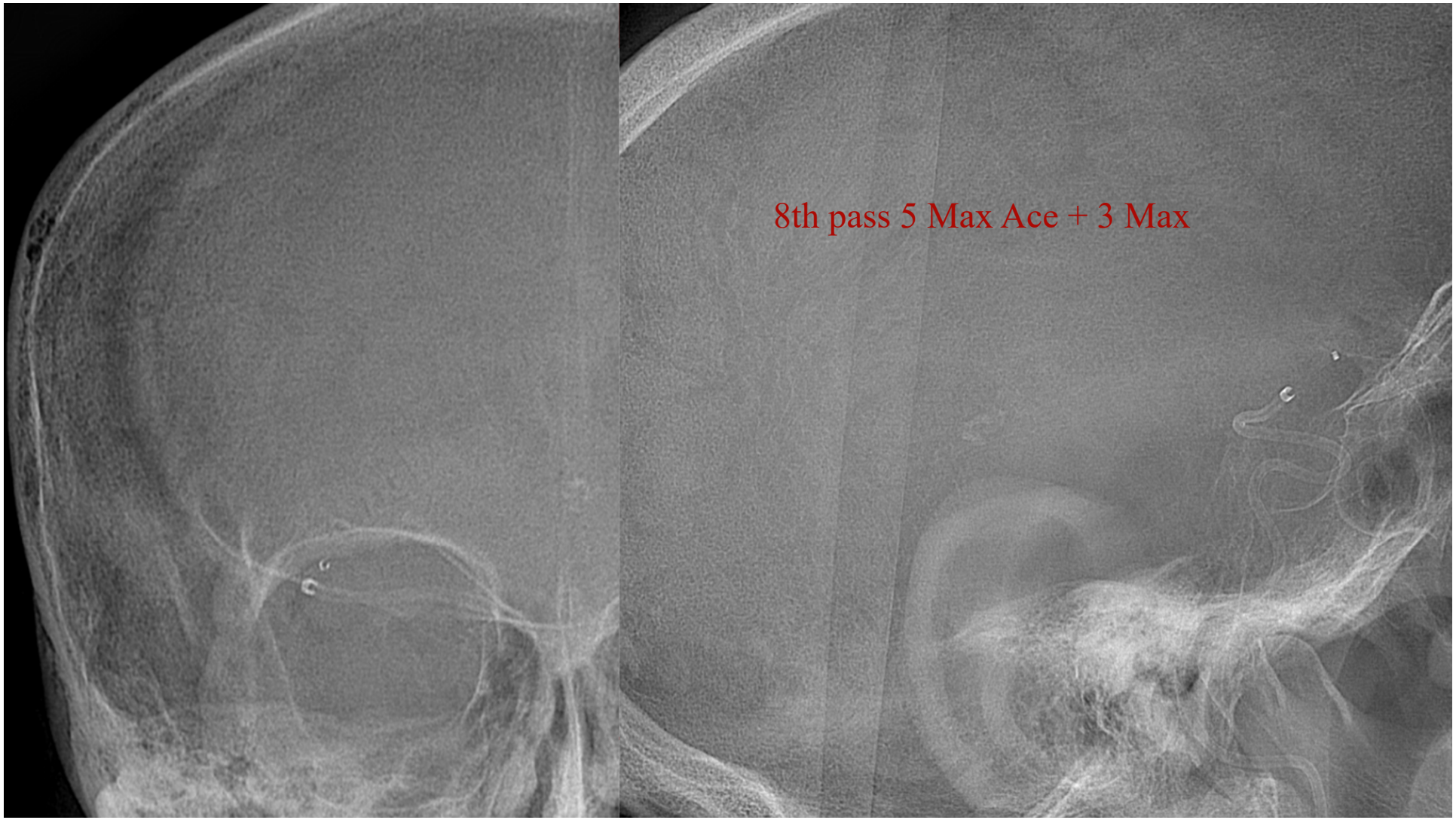
- M 64
- alcoholism
- Left MCA stroke, iv TPA
- Intra cardiac thrombus 10x15 mm
- Total recovery
- 10 days later, post coronary PTA stroke NIHSS 17
- MRI 41 min after stroke
- iv TPA 71 min
- Drip & Ship
- TOG 149 min

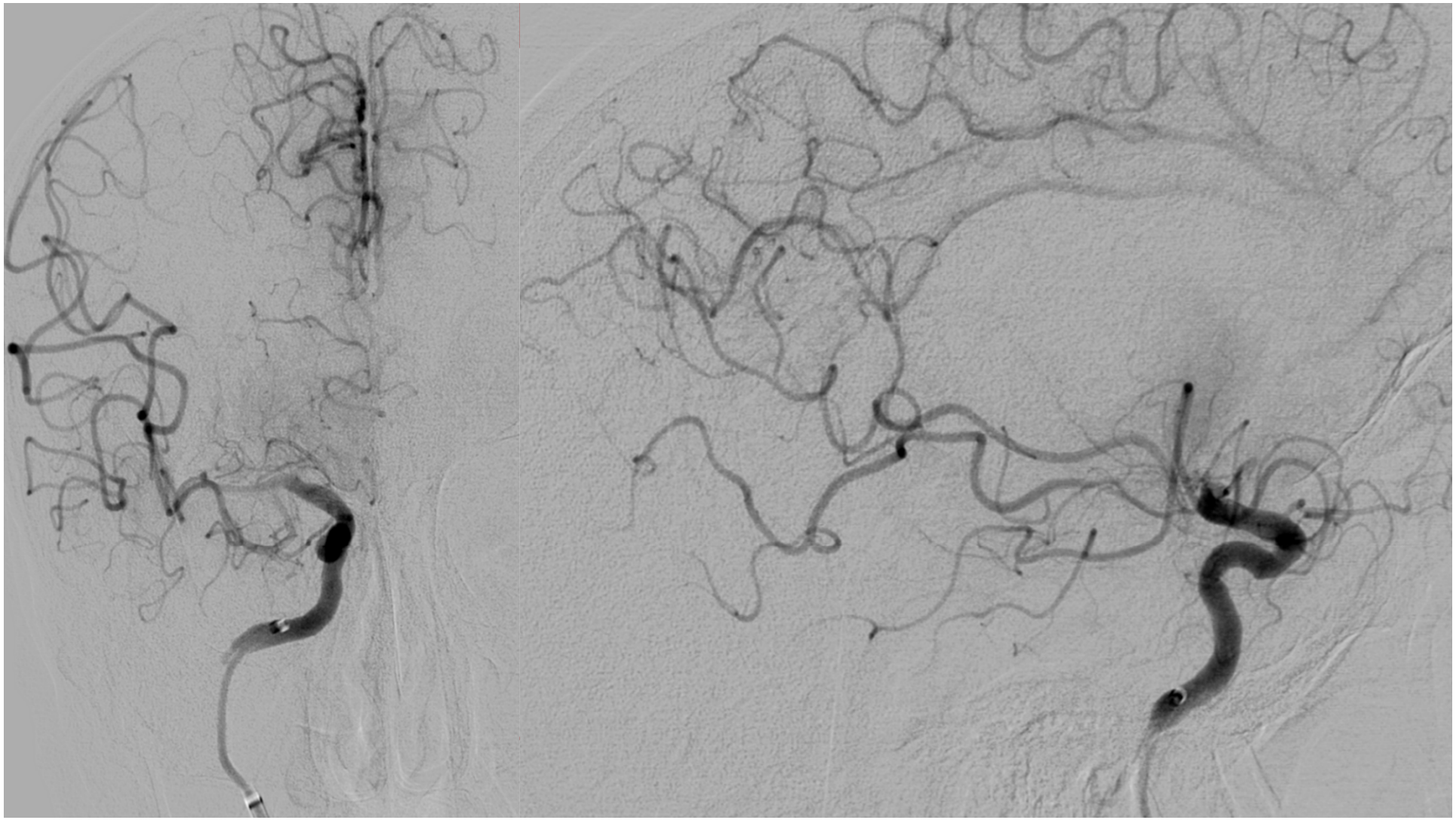


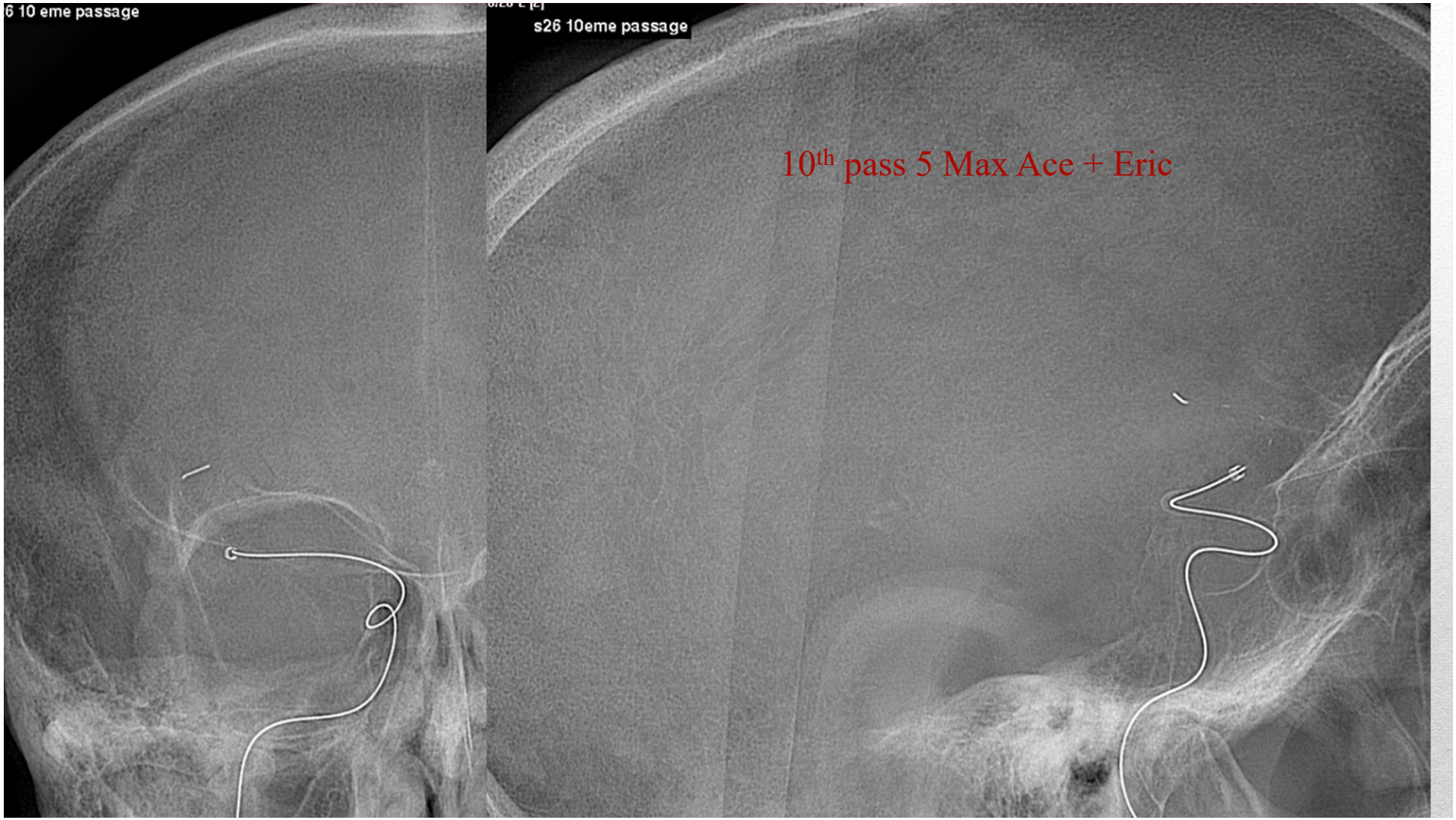


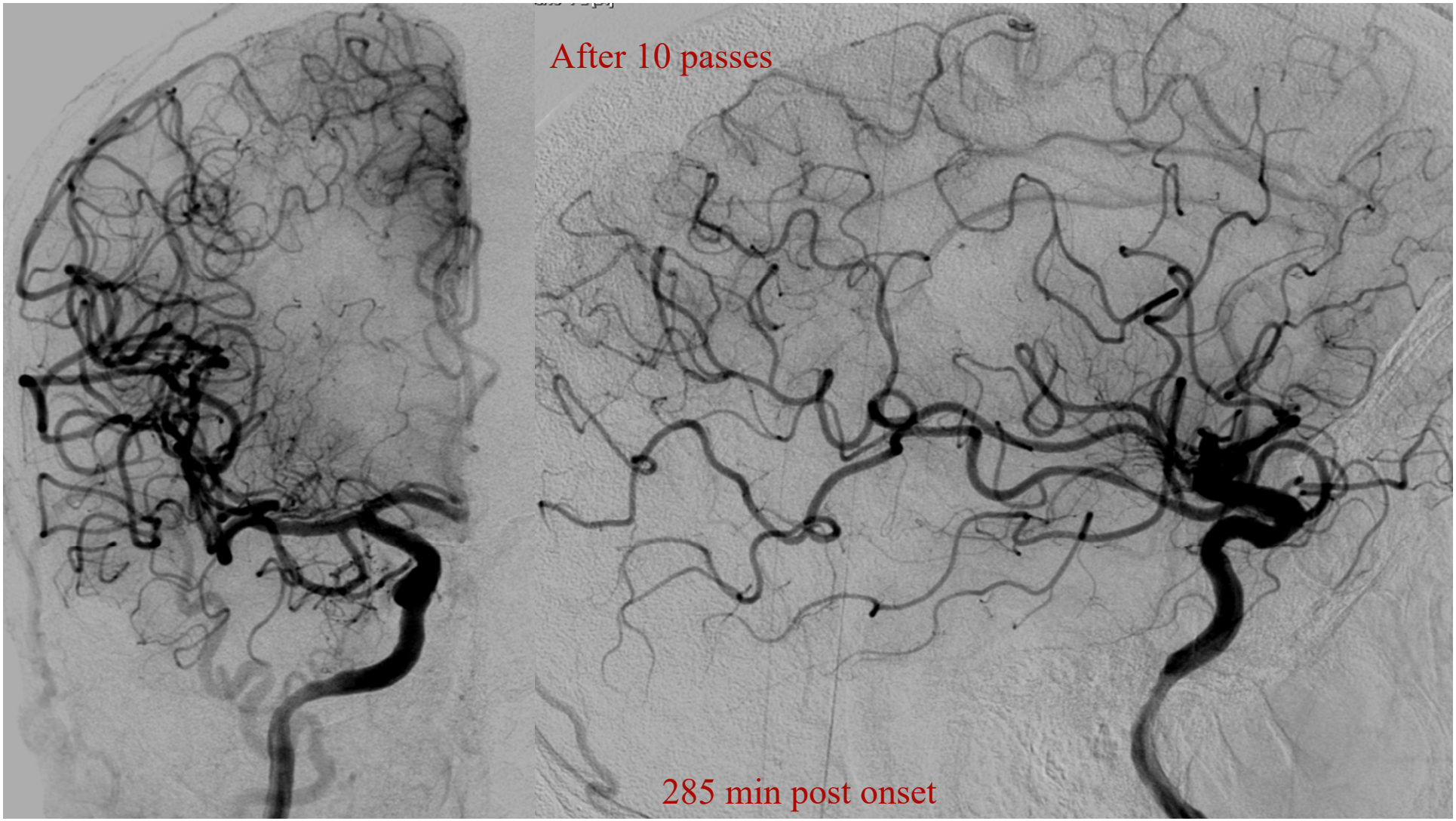

After 1 pass 5 Max ACE

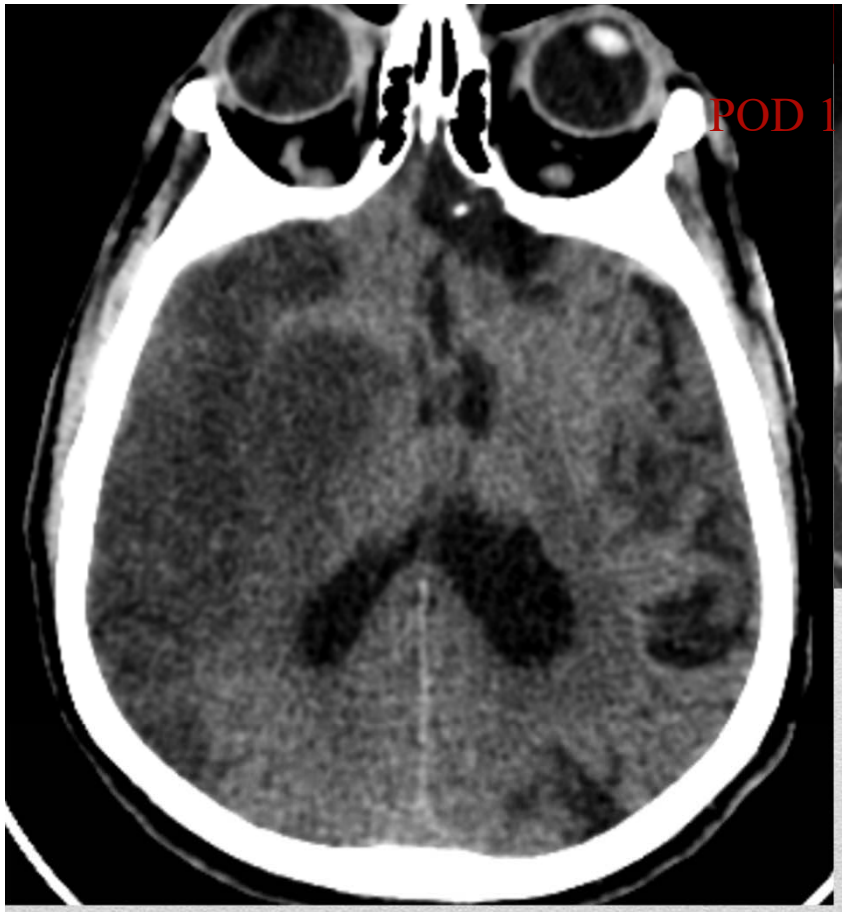

s19 7eme pasage
After 7 passes

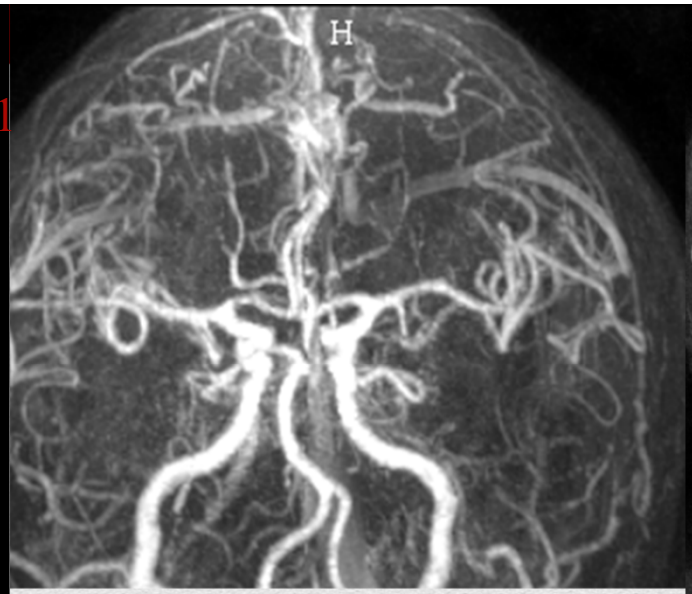

8th pass 5 Max Ace + 3 Max




6 10 eme passage
s26 10eme passage
10th pass 5 Max Ace + Eric


After 10 passes
285 min post onset





mRS 6 at 3 mo

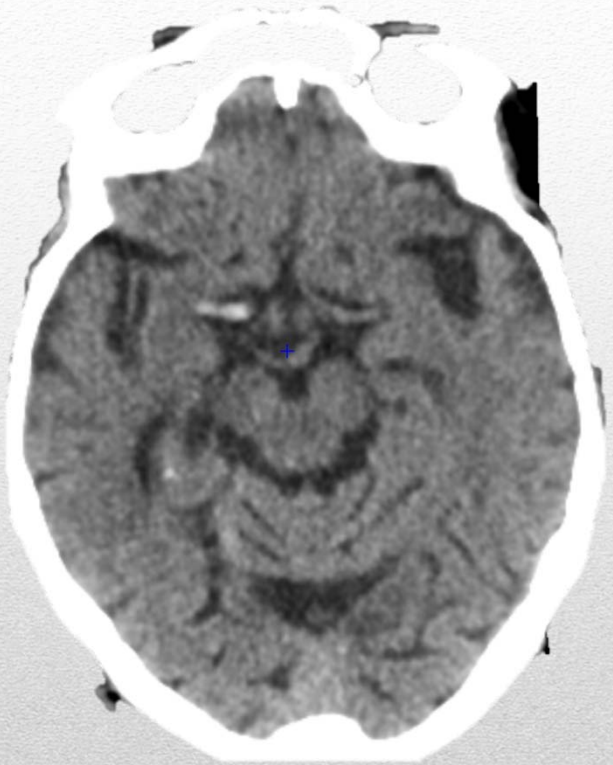
Perseverance

Perseverance

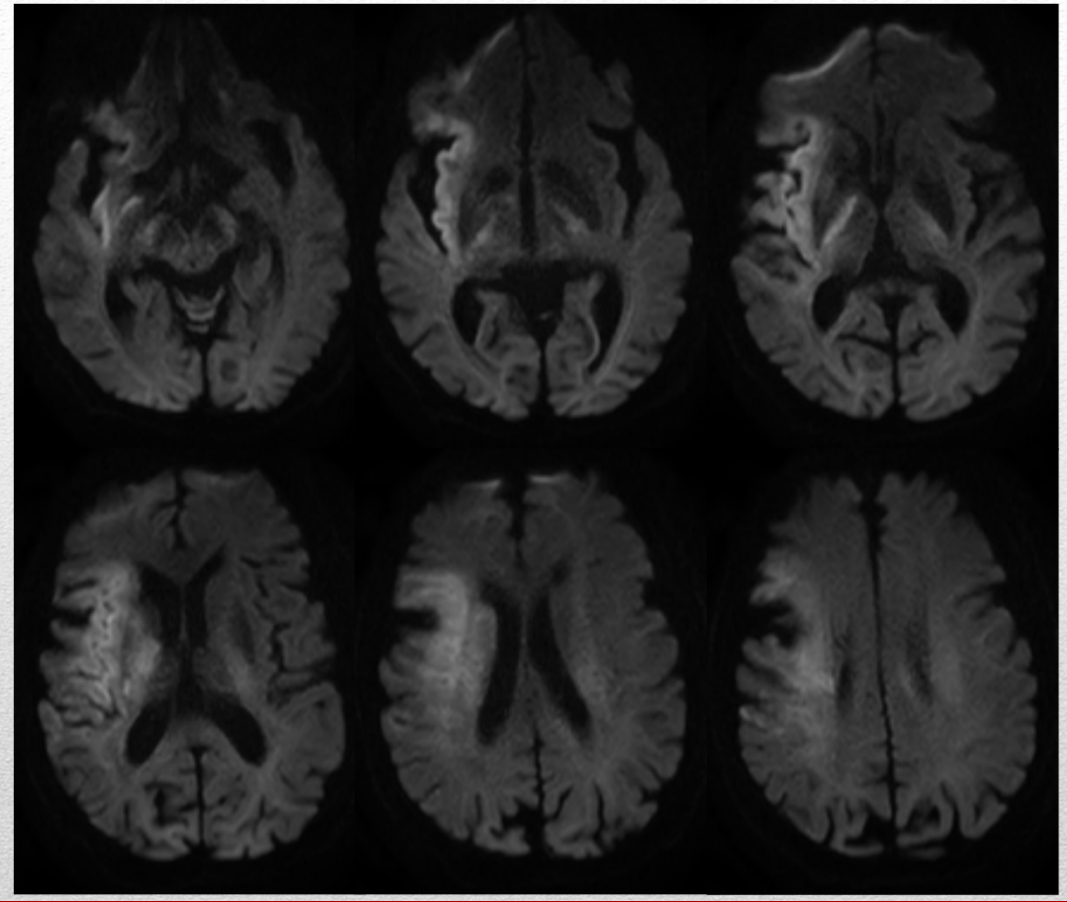
Rodriguez Eulalie
30/05/2015

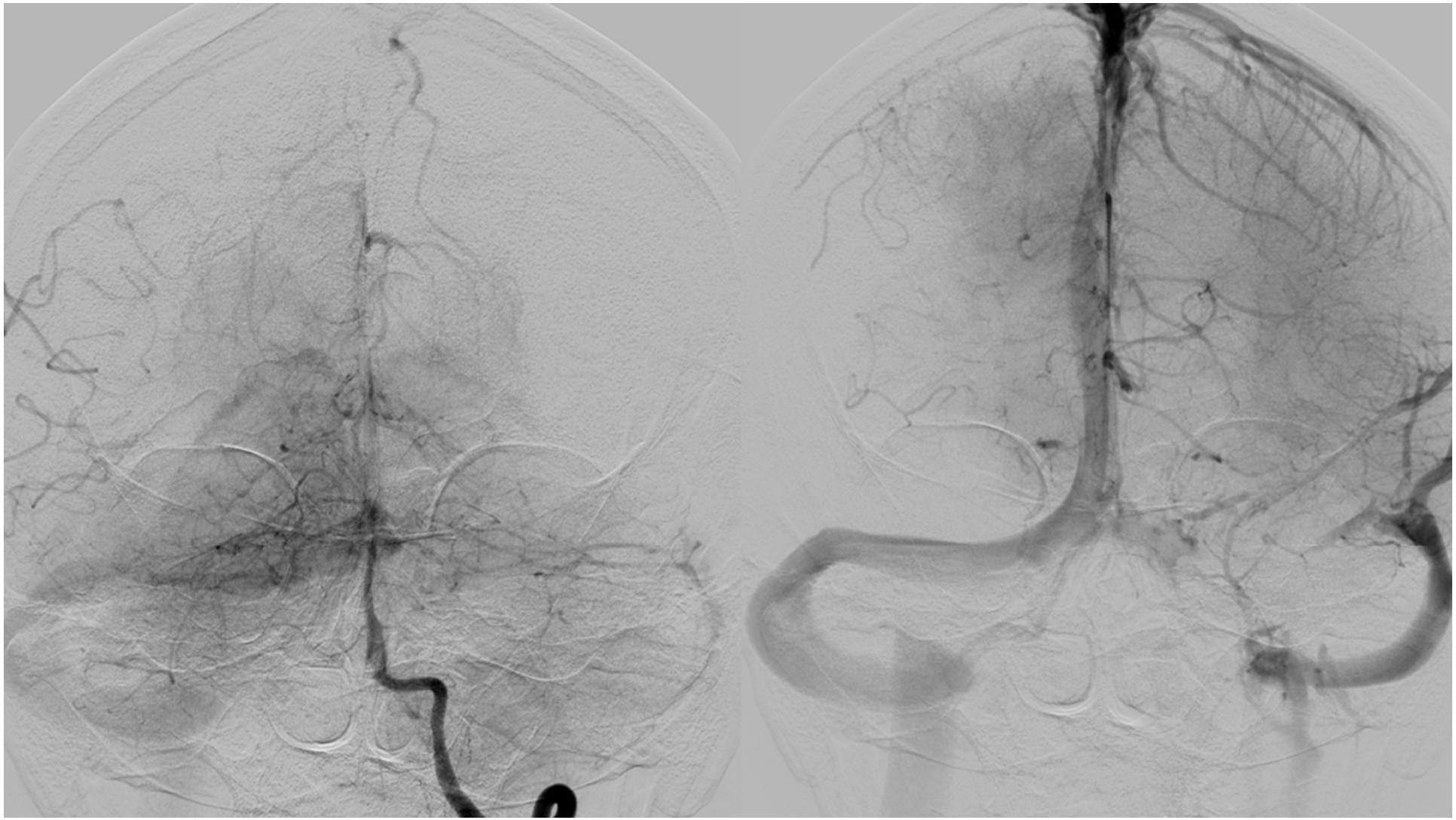
Metrics

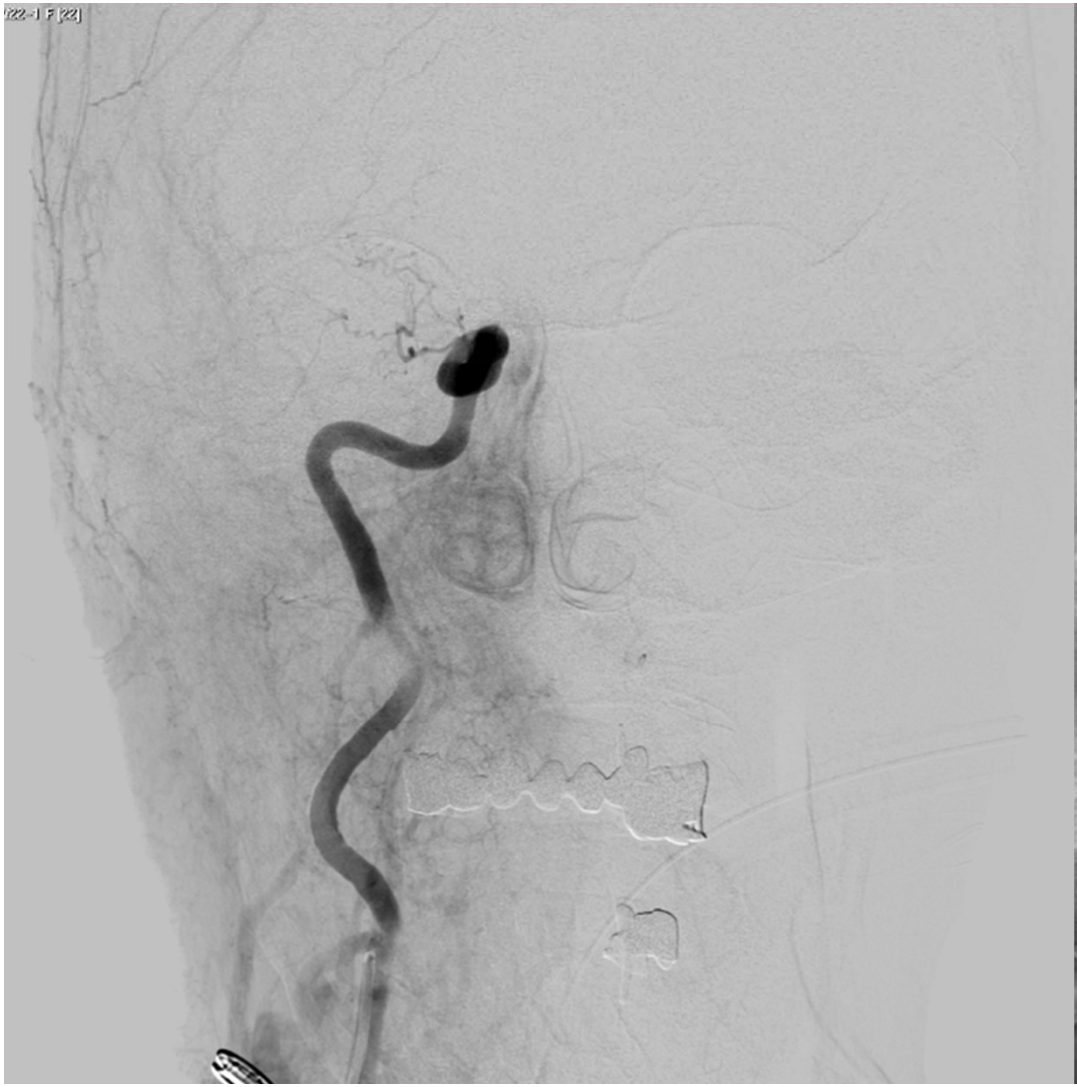
- F 83
- Primary care hospital
- Plain CT at 80 min after onset
- Shipping (no drip at that time), arrival at PSC 225 min
- NIHSS 17

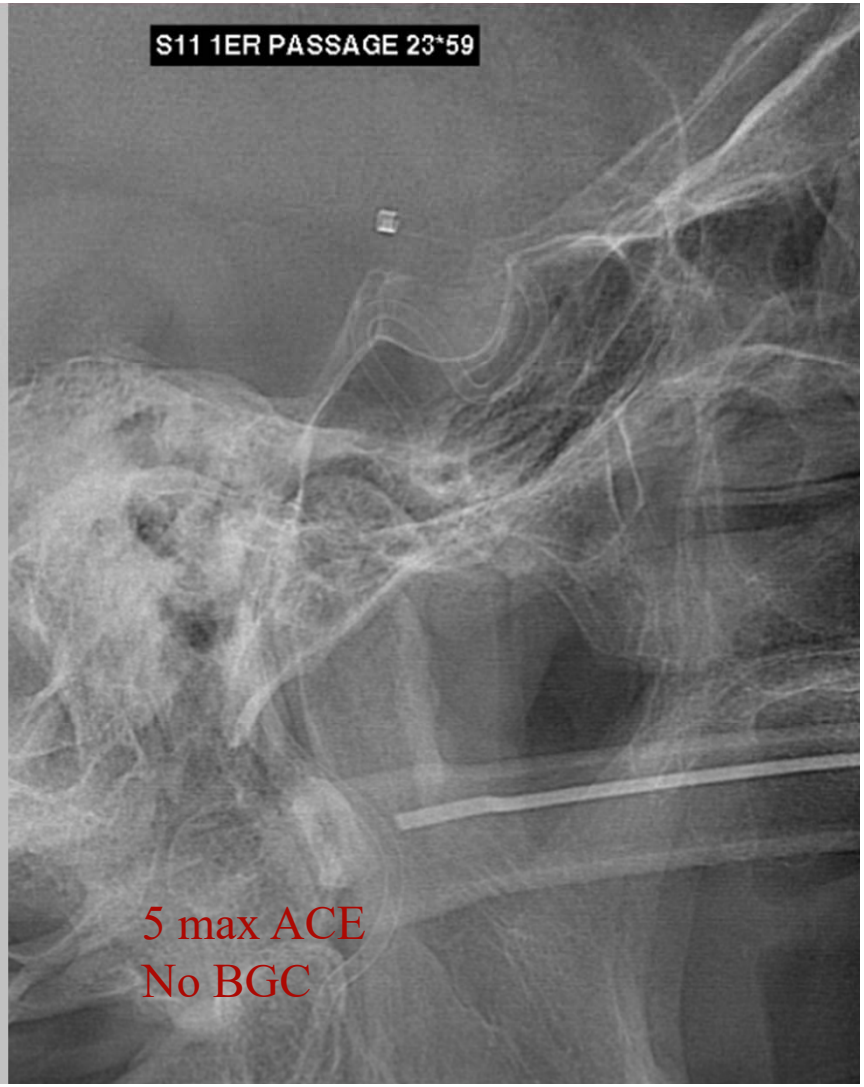


- MRI at 235 min
- DWI-ASPECTS 3
- iv TPA at 244 min
- TOG 364 min








S11 1ER PASSAGE 23*59
5 max ACE
No BGC

BACKGROUND AND PURPOSE: Flow arrest with balloon guide catheters (BGCs) is becoming increasingly recognized as critical to optimizing patient outcomes for mechanical thrombectomy. We performed a systematic review and meta-analysis of the literature for studies that compared angiographic and clinical outcomes for patients who underwent mechanical thrombectomy with and without BGCs. MATERIALS AND METHODS: In April 2017 a literature search on BGC and mechanical thrombectomy for stroke was performed. All studies included patients treated with and without BGCs using modern techniques (ie, stent retrievers). Using random effects meta-analysis, we evaluated the following outcomes: first-pass recanalization, Thrombolysis In Cerebral Infarction (TICI) 3 recanalization, TICI 2b/3 recanalization, favorable outcome (modified Rankin Scale (mRS) 0-2), mortality, and mean number of passes and procedure time. RESULTS: Five non-randomized studies of 2022 patients were included (1083 BGC group and 939 non-BGC group). Compared with the non-BGC group, patients treated **with BGCs had higher odds of first-pass recanalization** (OR 2.05, 95% CI 1.65 to 2.55), TICI 3 (OR 2.13, 95% CI 1.43 to 3.17), TICI 2b/3 (OR 1.54, 95% CI 1.21 to 1.97), and mRS 0-2 (OR 1.84, 95% CI 1.52 to 2.22). BGC-treated patients also had **lower odds of mortality** (OR 0.52, 95% CI 0.37 to 0.73) compared with non-BGC patients. The **mean number of passes was significantly lower for BGC**-treated patients (weighted mean difference -0.34, 95% CI-0.47 to -0.22). Mean **procedure time was also significantly shorter for BGC**-treated patients (weighted mean difference -7.7 min, 95% CI-9.0to -6.4). CONCLUSIONS: Non-randomized studies suggest that BGC use during mechanical thrombectomy for acute ischemic stroke is associated with superior clinical and angiographic outcomes. Further randomized trials are needed to confirm the results of this study

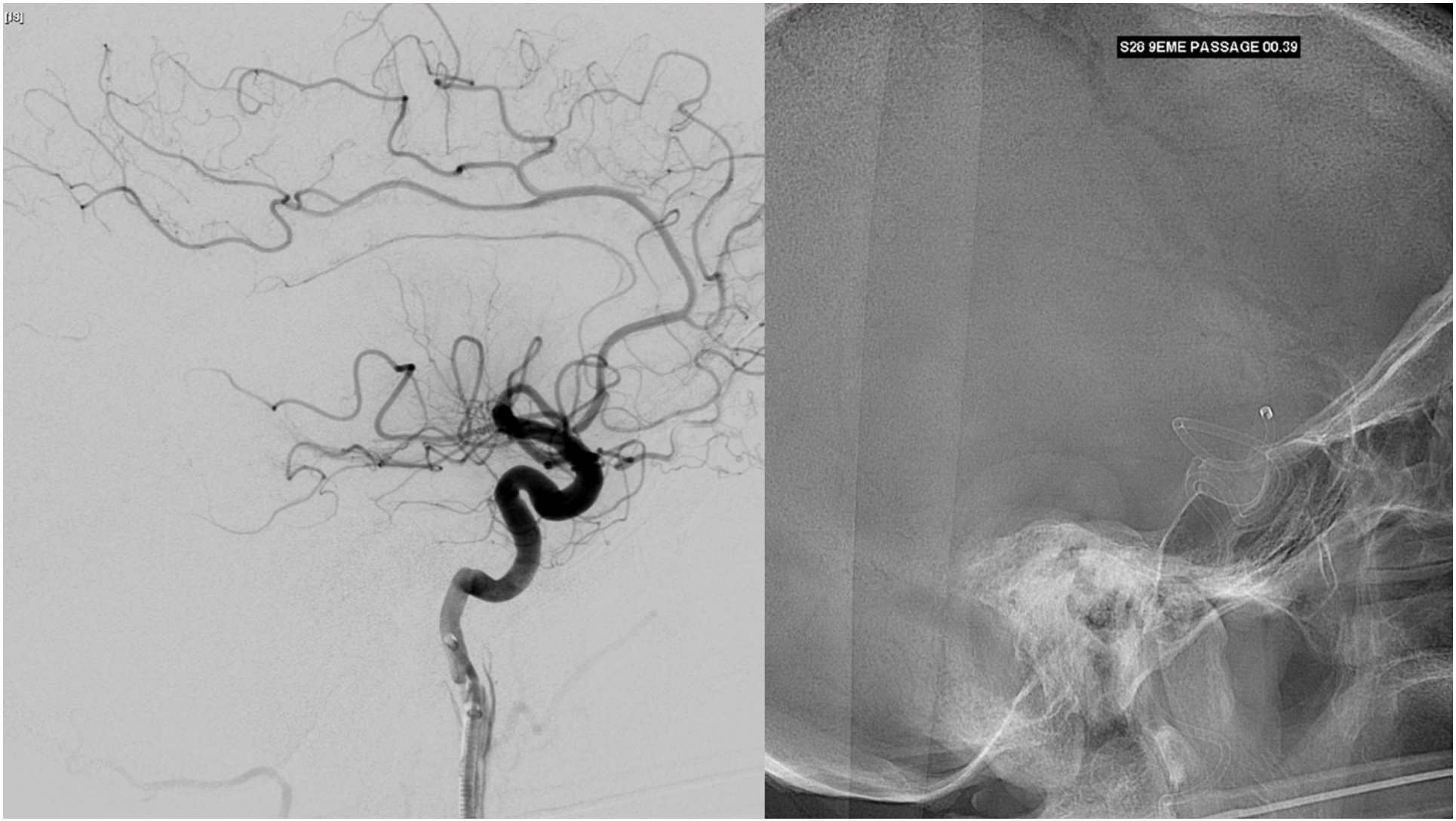
ORIGINAL RESEARCH

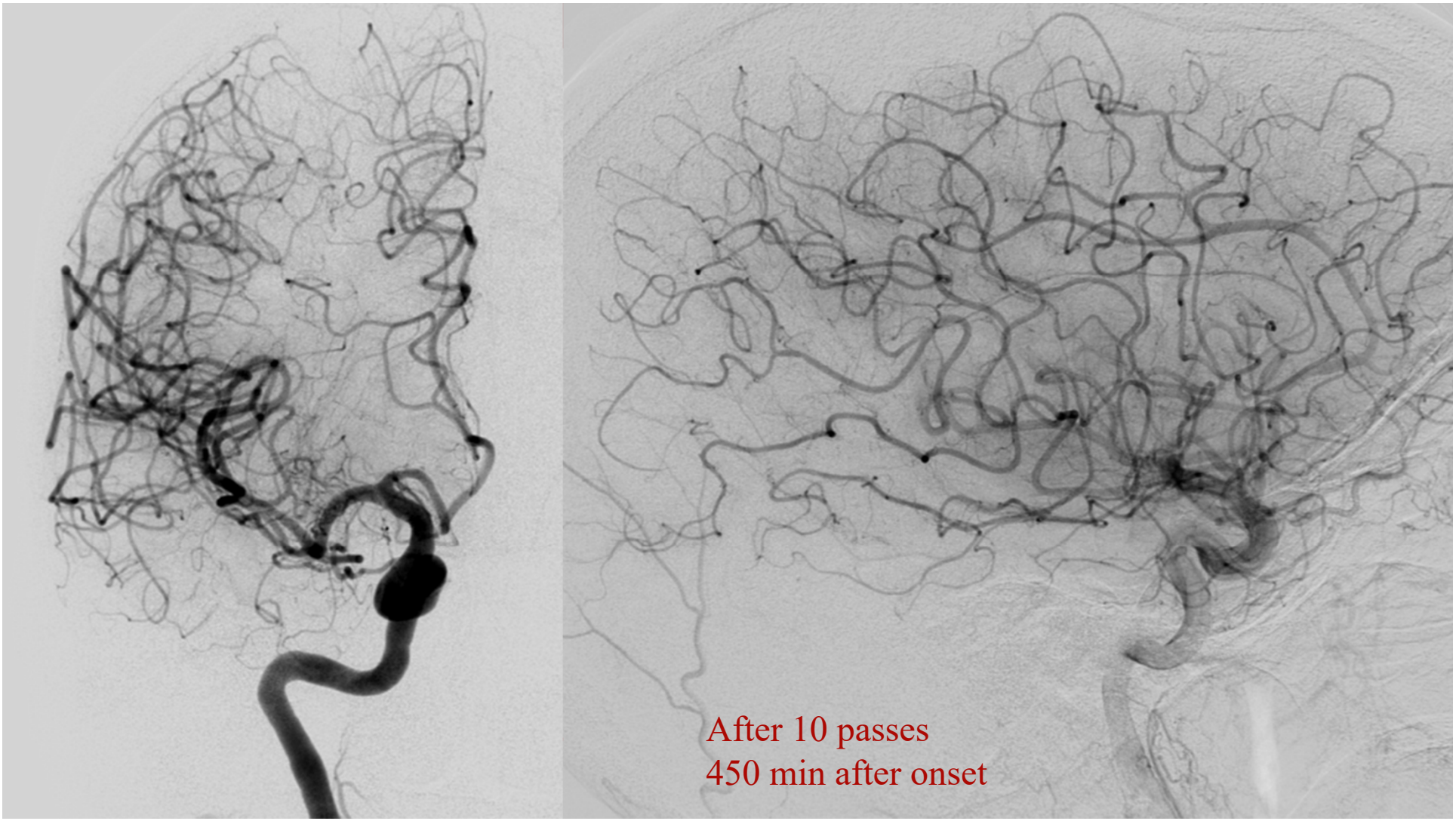
Impact of balloon guide catheter on technical and clinical outcomes: a systematic review and meta-analysis

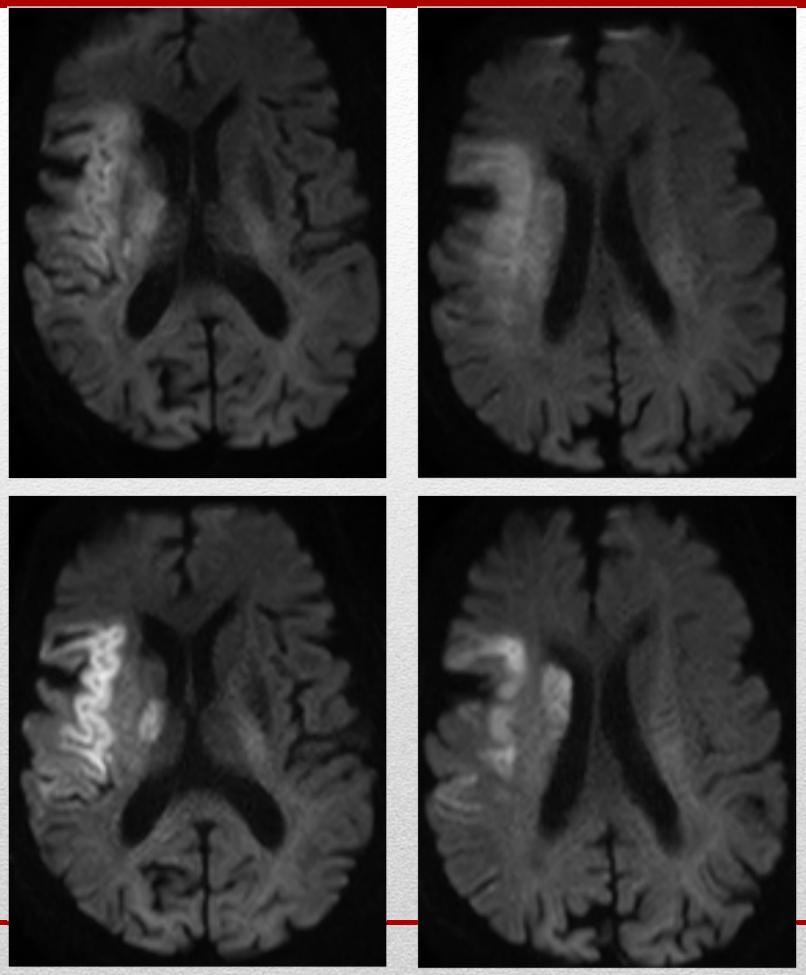
Waleed Brinjikji,[1,2,3] Robert M Starke,[4,5] M Hassan Murad,[6] David Fiorella,[7] Vitor M Pereira,[8] Mayank Goyal,[9] David F Kallmes[1,2]

J Neurointerv Surg. 2018 Apr;10(4):335-339.


8EME PASSAGE 00*30


[3]
S26 9EME PASSAGE 00.39


After 10 passes
450 min after onset



initial DWI

POD 1 DWI

- From NIHSS 17 to NIHSS 10 at day 1
- 3 mo mRS 2

F/U

Dual ST

Technique

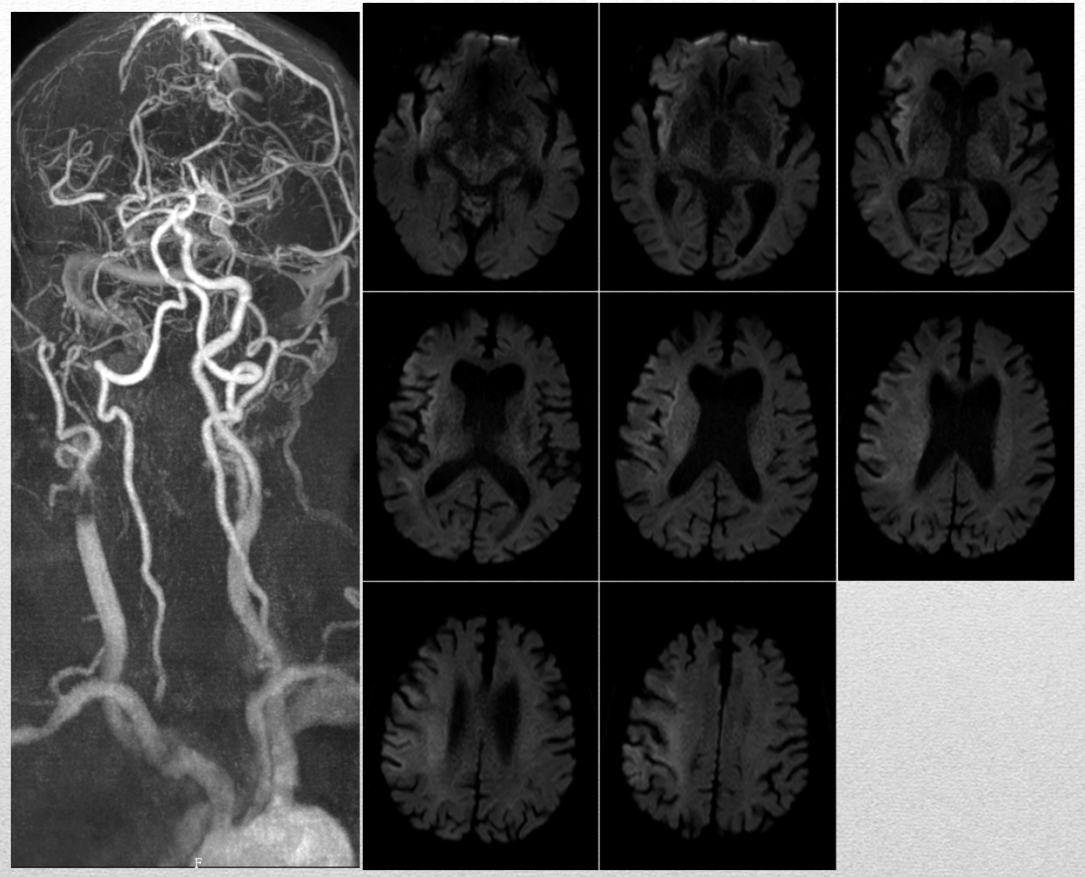
Dual ST

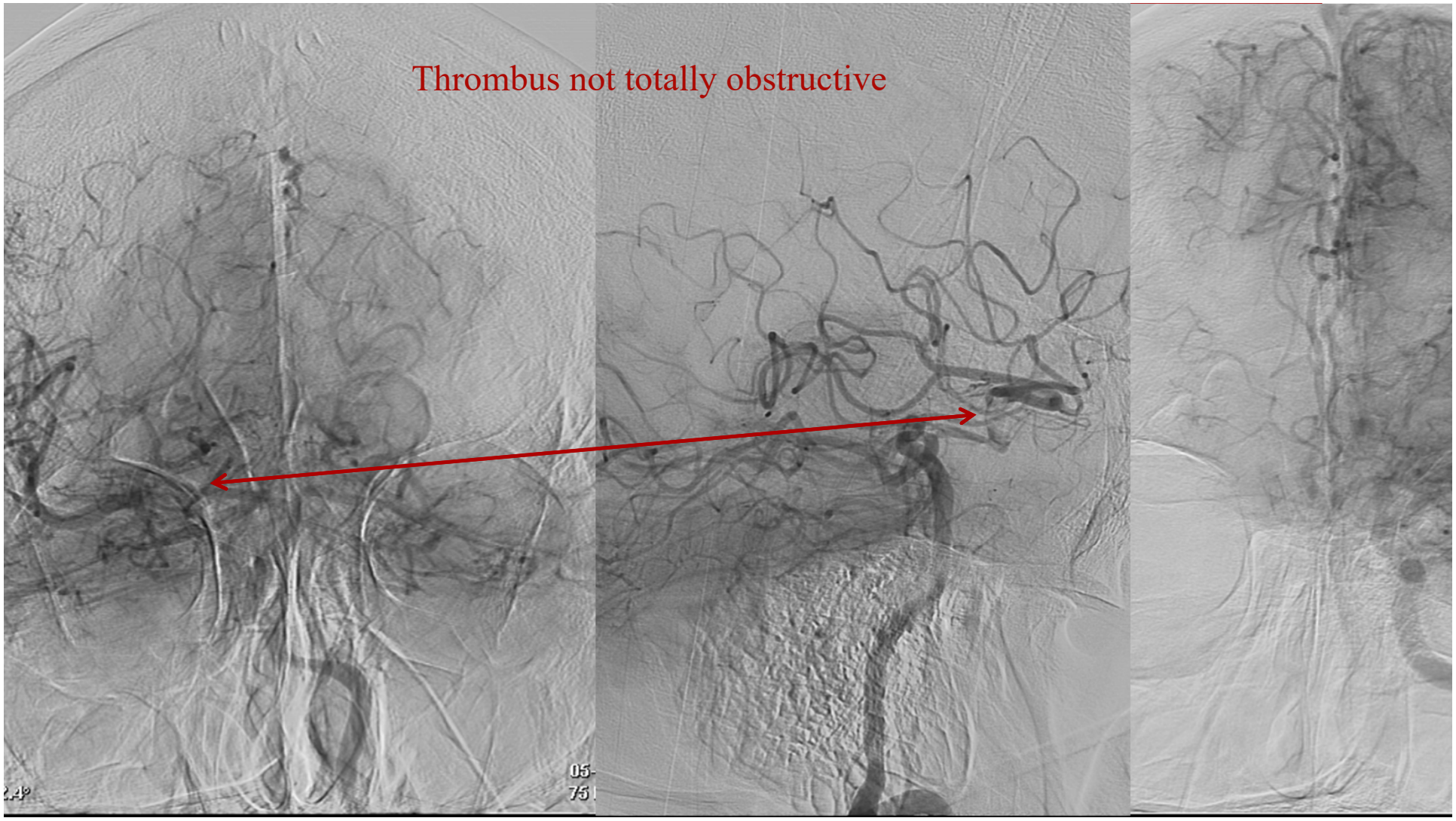
Technique

Quentin Roger
5/8/2017

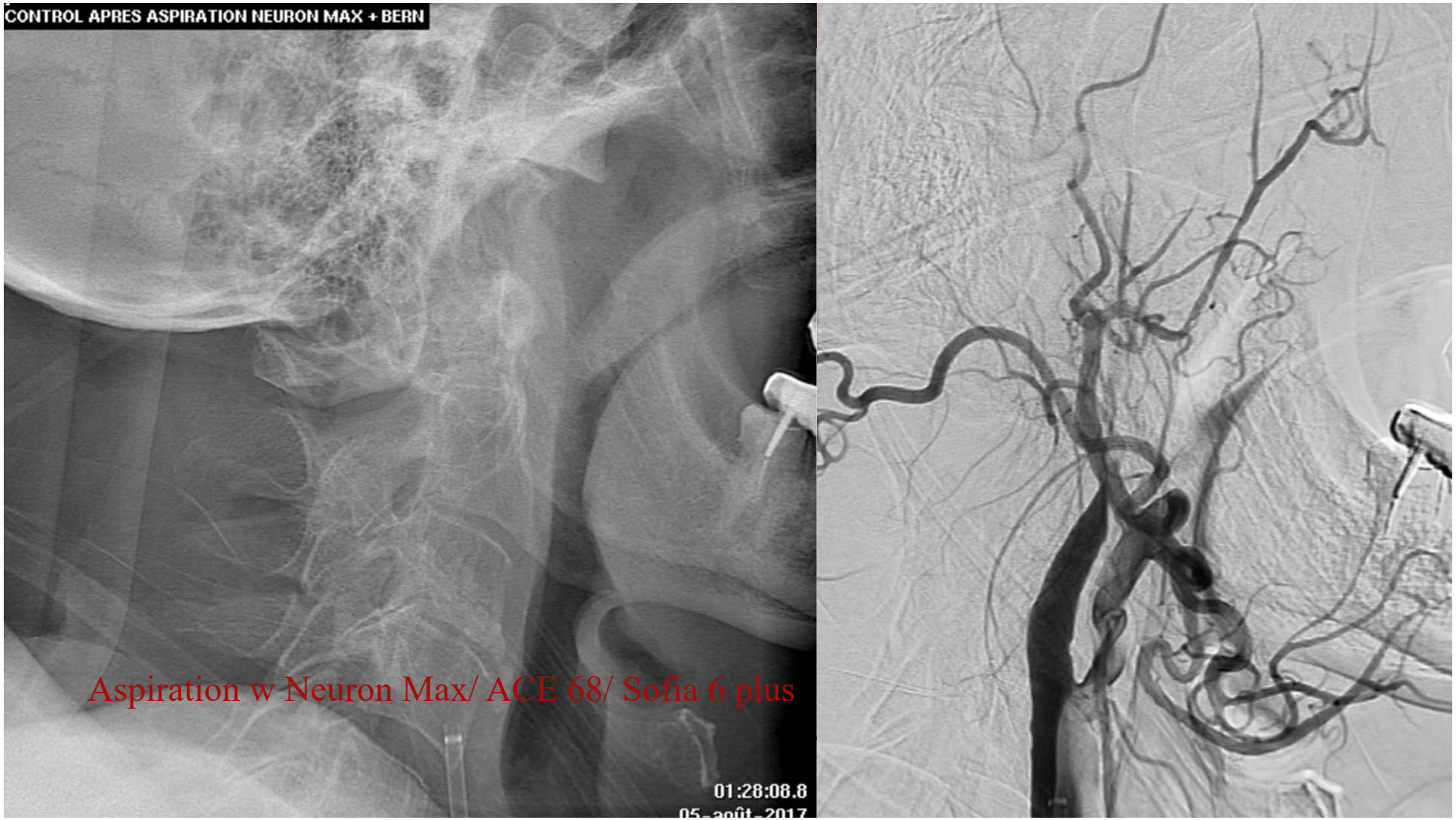
Metrics

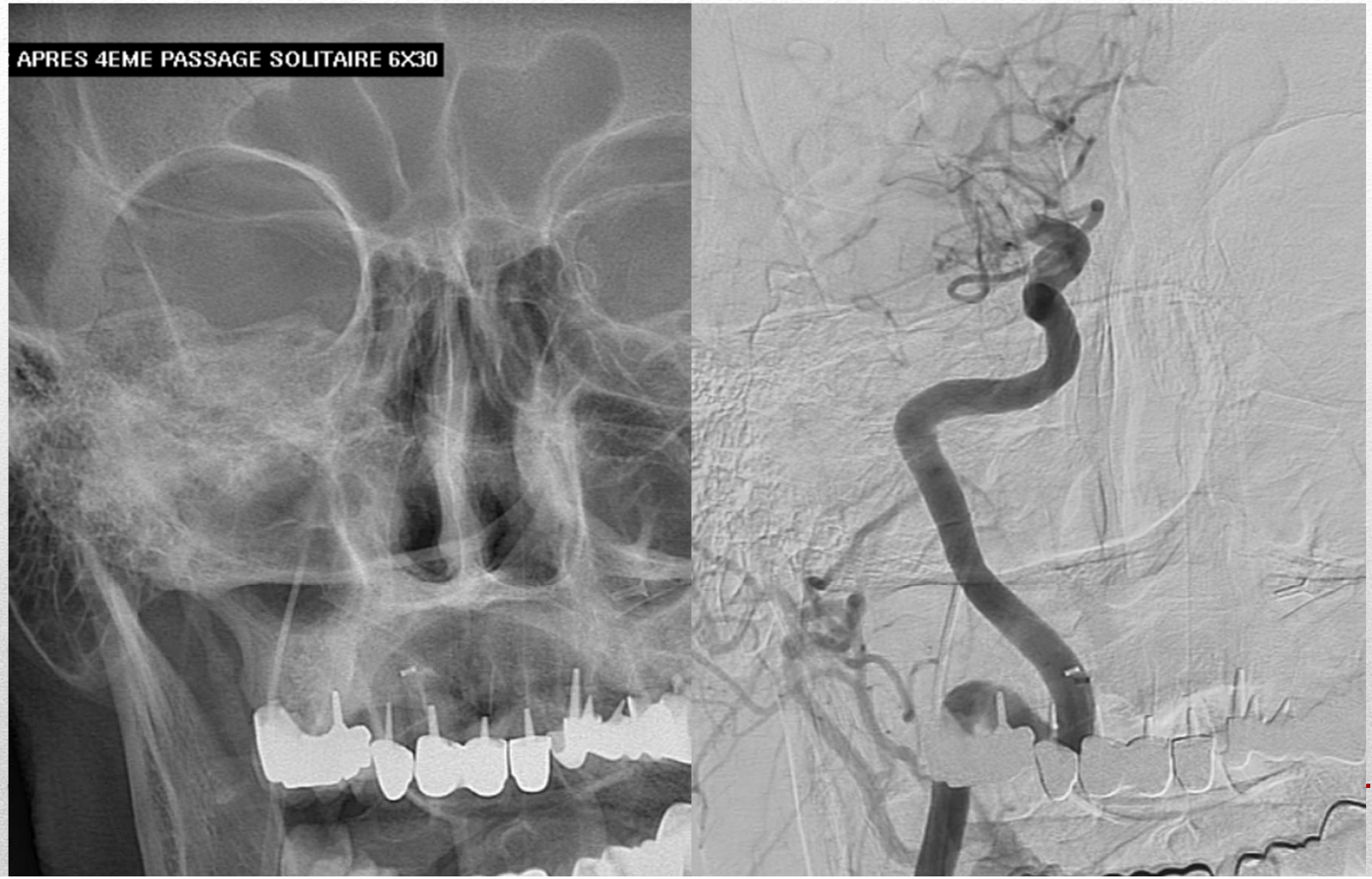
- M 85
- NIHSS 18
- MRI 135 min
- DWI-ASPECTS 5
- No iv TPA (CI)
- TOG 213 min

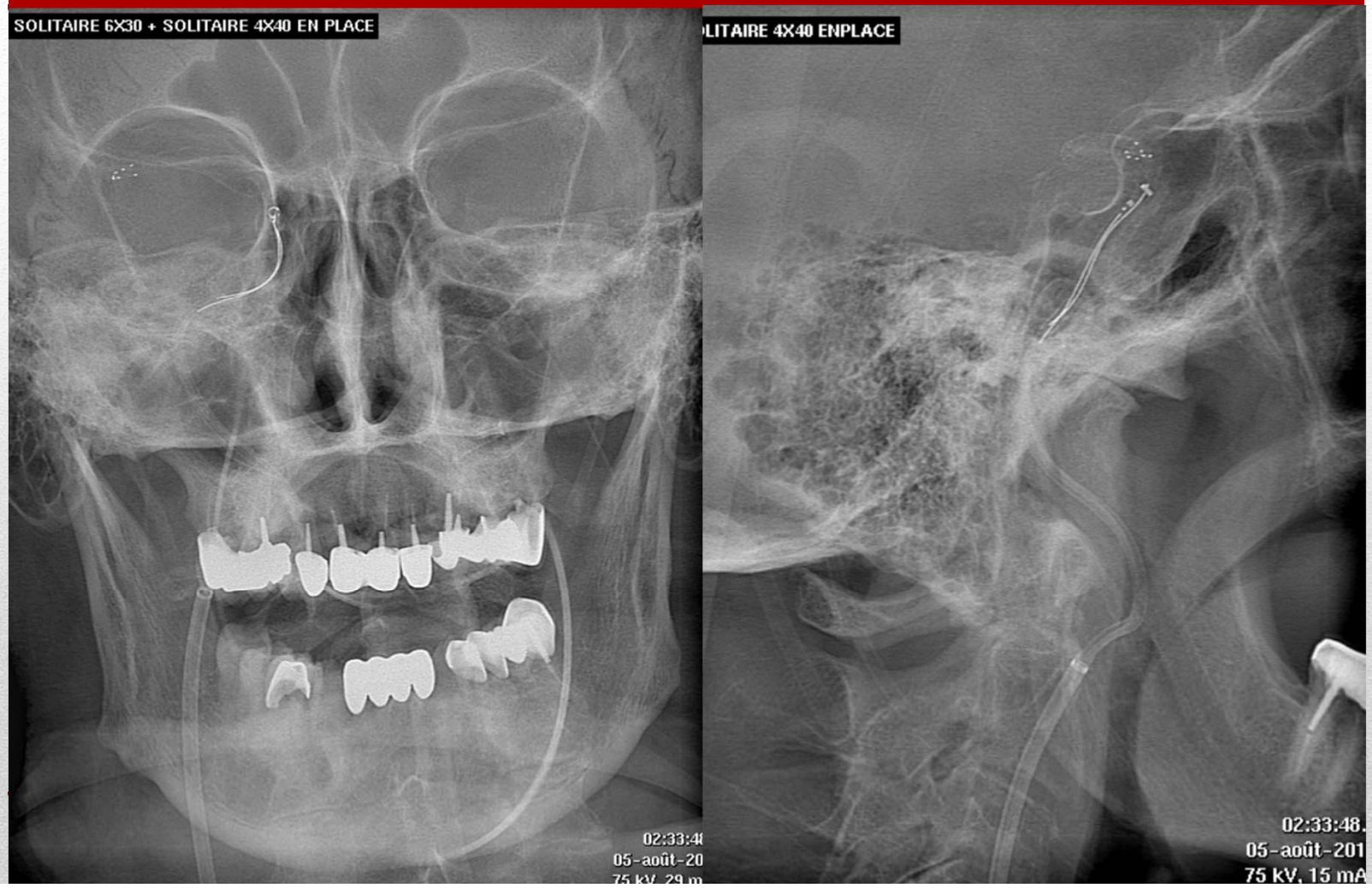



Thrombus not totally obstructive


Incl -14.6°
Rot -90.6° Incl -0.3°


CONTROL APRES ASPIRATION NEURON MAX + BERN
Aspiration w Neuron Max/ ACE 68/ Sofia 6 plus
01:28:08.8

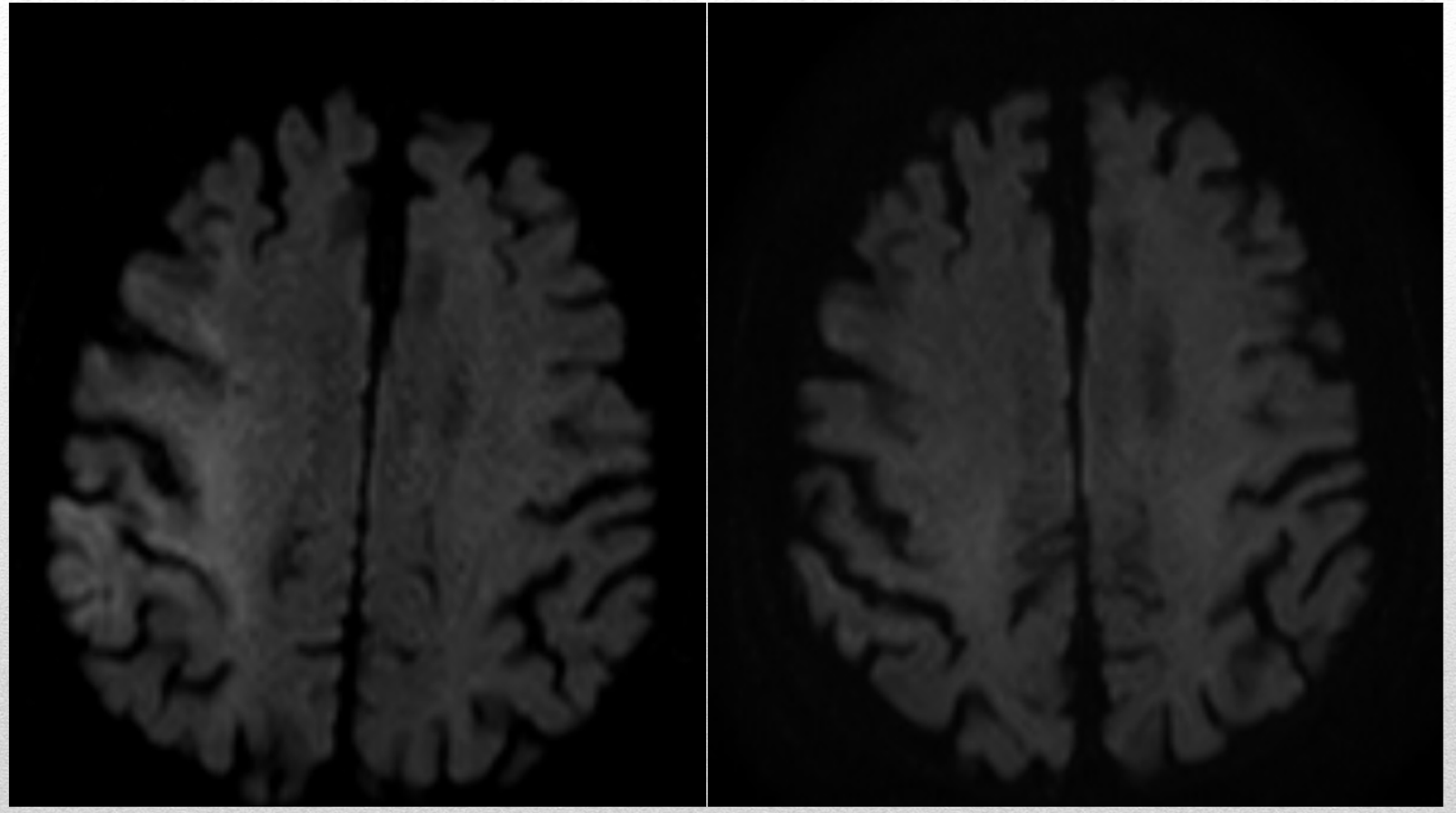

APRES 4EME PASSAGE SOLITAIRE 6X30


SOLITAIRE 6X30 + SOLITAIRE 4X40 EN PLACE
LITAIRE 4X40 ENPLACE
02:33:48
05-août-201
75 kV, 15 mA

- 1 Neuron Max
- 3 ACE 68
- 1 Solumbra (ACE 68/Solitaire 6-30)
- 1 Sofia 6+
- 3 Solumbra (Sofia 6+/Solitaire 6-30)
- 1 ***Dual SR*** Solumbra (Sofia 6+/ Solitaire 6-30/Solitaire 4-40

10 passes

After 10 passes



Before MT

POD 1

F/U

- From NIHSS 18 to NIHSS 0
- mRS 0 at 3 mo F/U

BACKGROUND AND PURPOSE: Mechanical thrombectomy by using a single stent retriever system has demonstrated high efficacy for recanalization of large-artery occlusions in acute stroke. We aimed to evaluate thefeasibility, safety, and efficacy of a novel double Solitaire stent retriever technique as an escalating treatment for occlusions that are refractory to first-line single stent retriever mechanical thrombectomy. MATERIALS AND METHODS: All patients treated with the double stent retriever technique by using the Solitaire system were retrospectively selected from 2 large neurointerventional centers. Time to recanalization, angiographic (TICI) and clinical outcomes (mRS), and complications were assessed. RESULTS: Ten patients (median NIHSS score, 16; mean age, 70 years) with MCA M1 segment (n = 5) and terminal ICA (n = 5 including 2 ICA tandem) occlusions were included. Prior single stent retriever mechanical thrombectomy had been performed in 9 patients (median number of passes, 3). Median time to recanalization was 60 minutes (interquartile range, 45-87 minutes). Procedure-related complications occurred in 1 patient; overall mortality was 20%. Recanalization of the target vessel **(TICI 2b/3) was achieved in 80%**. Good clinical outcome (mRS 0-2) was 50%. CONCLUSIONS: In this preliminary feasibility study, the double Solitaire stent retriever technique proved to be an effective method for recanalization of anterior circulation large-artery occlusions refractory to standard stent retriever mechanical thrombectomy.

Double Solitaire Mechanical Thrombectomy in Acute Stroke: Effective Rescue Strategy for Refractory Artery Occlusions?

J. Klisch, V. Sychra, C. Strasilla, C.A. Taschner, M. Reinhard, H. Urbach and S. Meckel

American Journal of Neuroradiology March 2015, 36 (3) 552-556; DOI: https://doi.org/10.3174/ajnr.A4133

Balloon

Angioplasty

Without stent

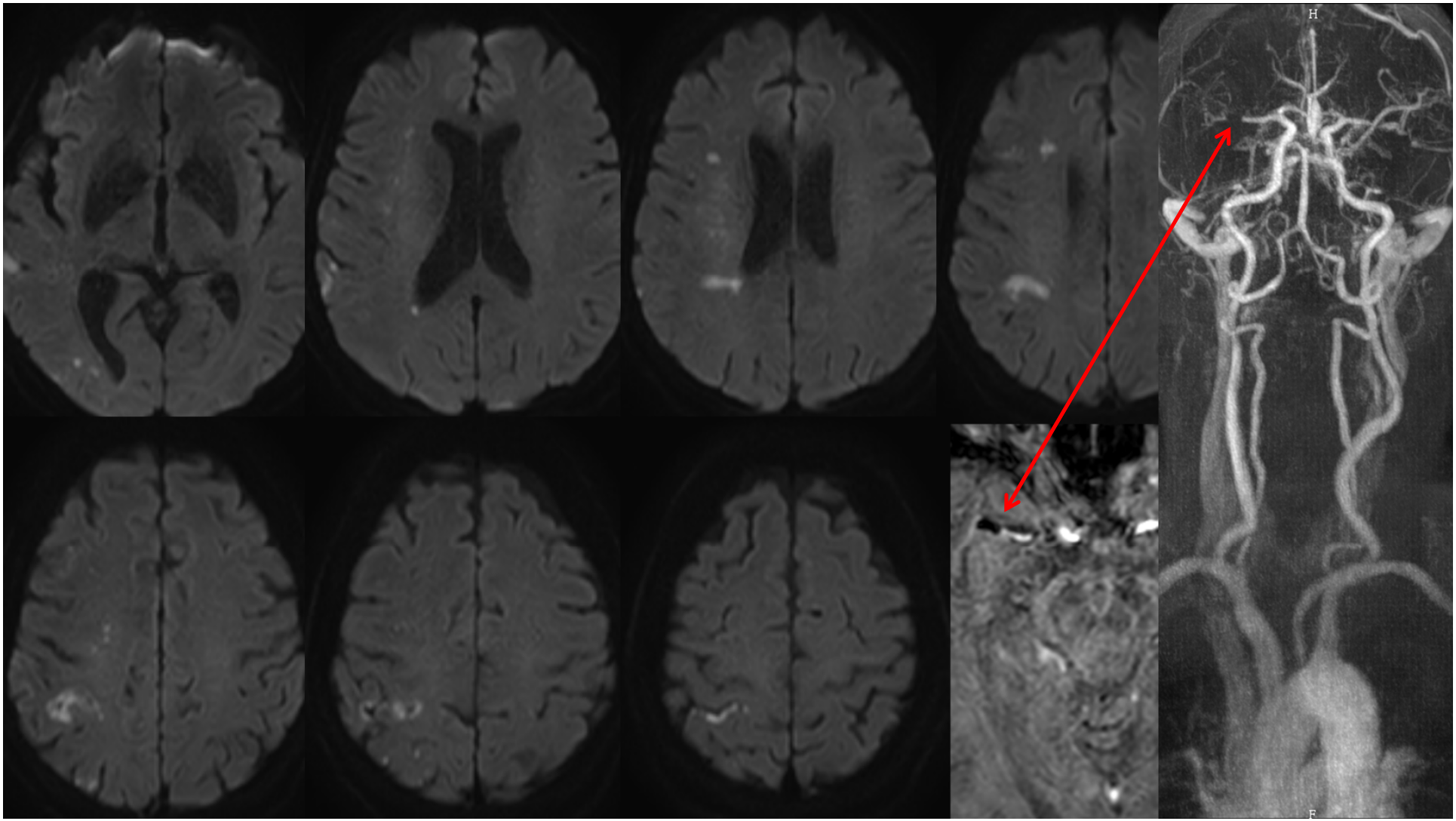
Balloon Angioplasty

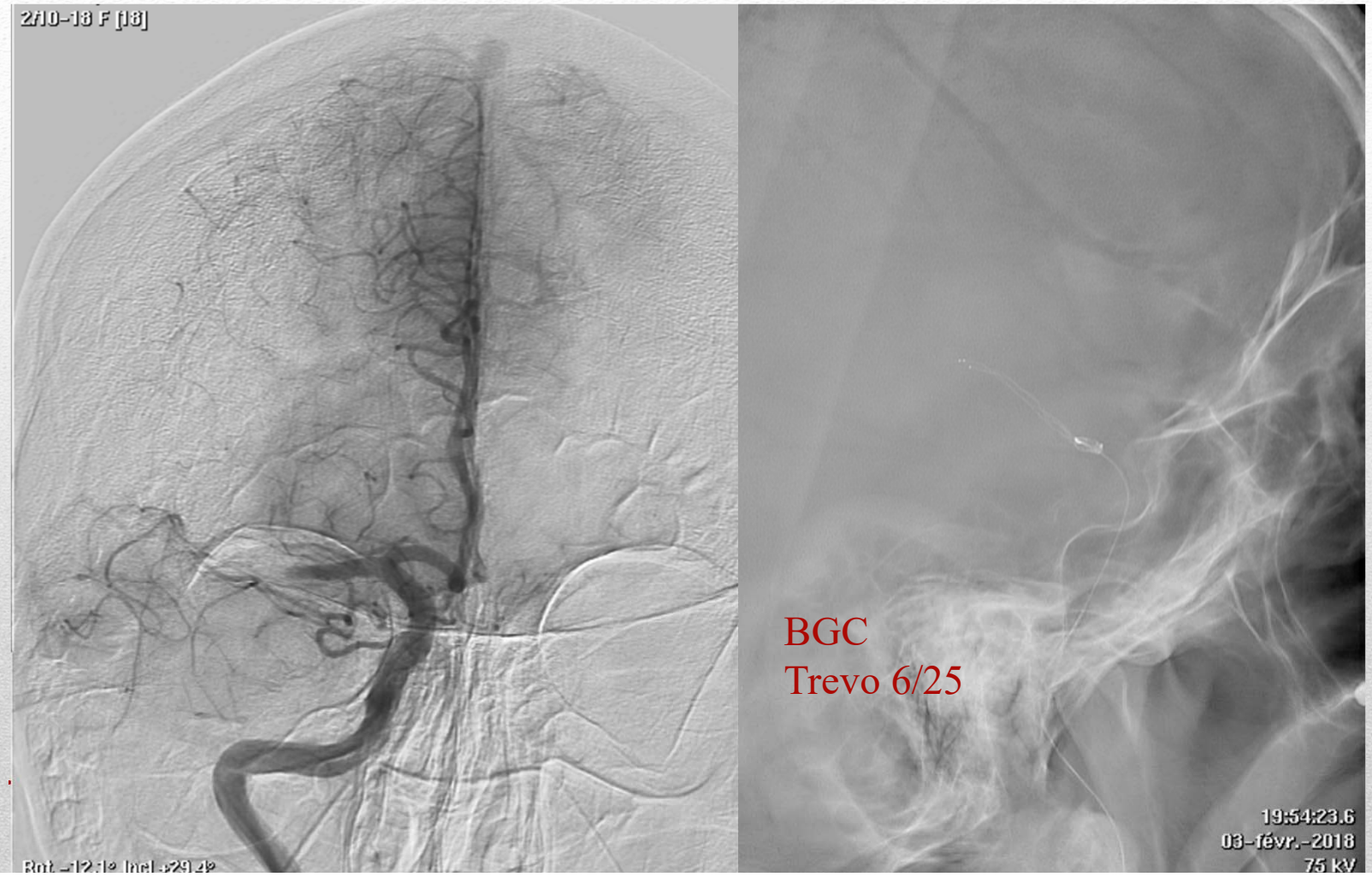
Martin Chantal

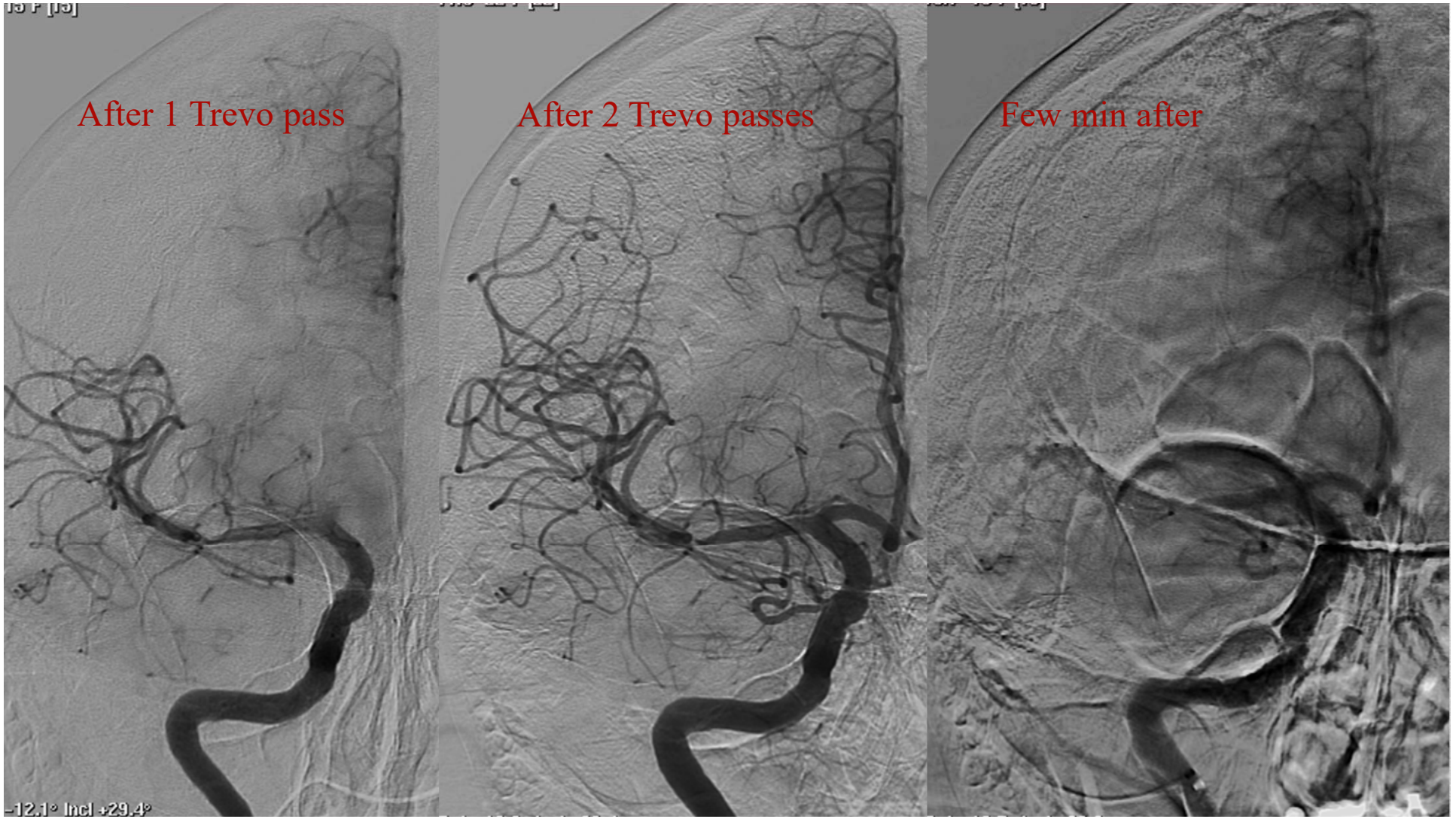
3/2/18

- F 73
- LSW 22h ago
- NIHSS 12
- No iv TPA
- TOG nearly 24h

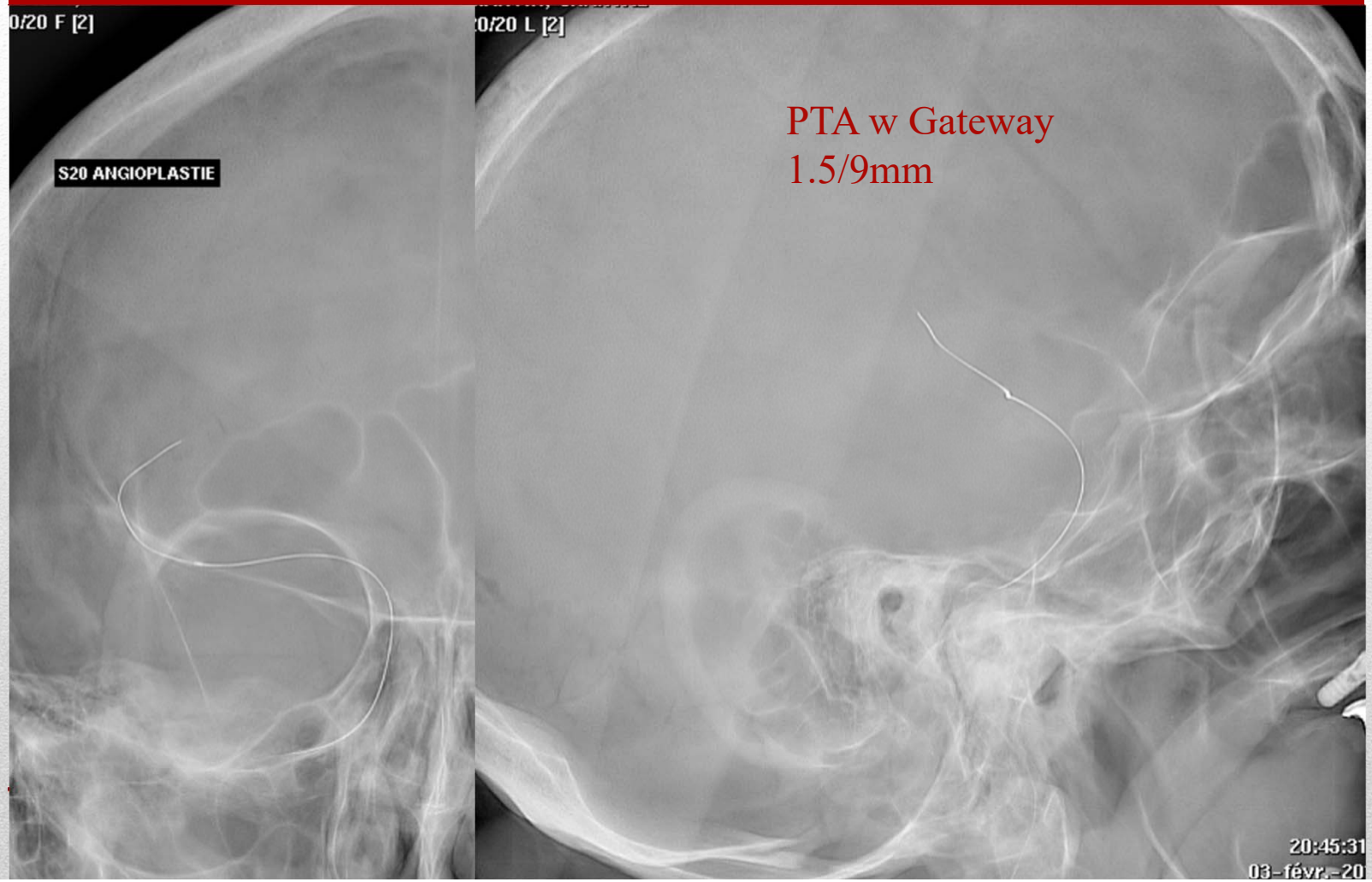
Metrics

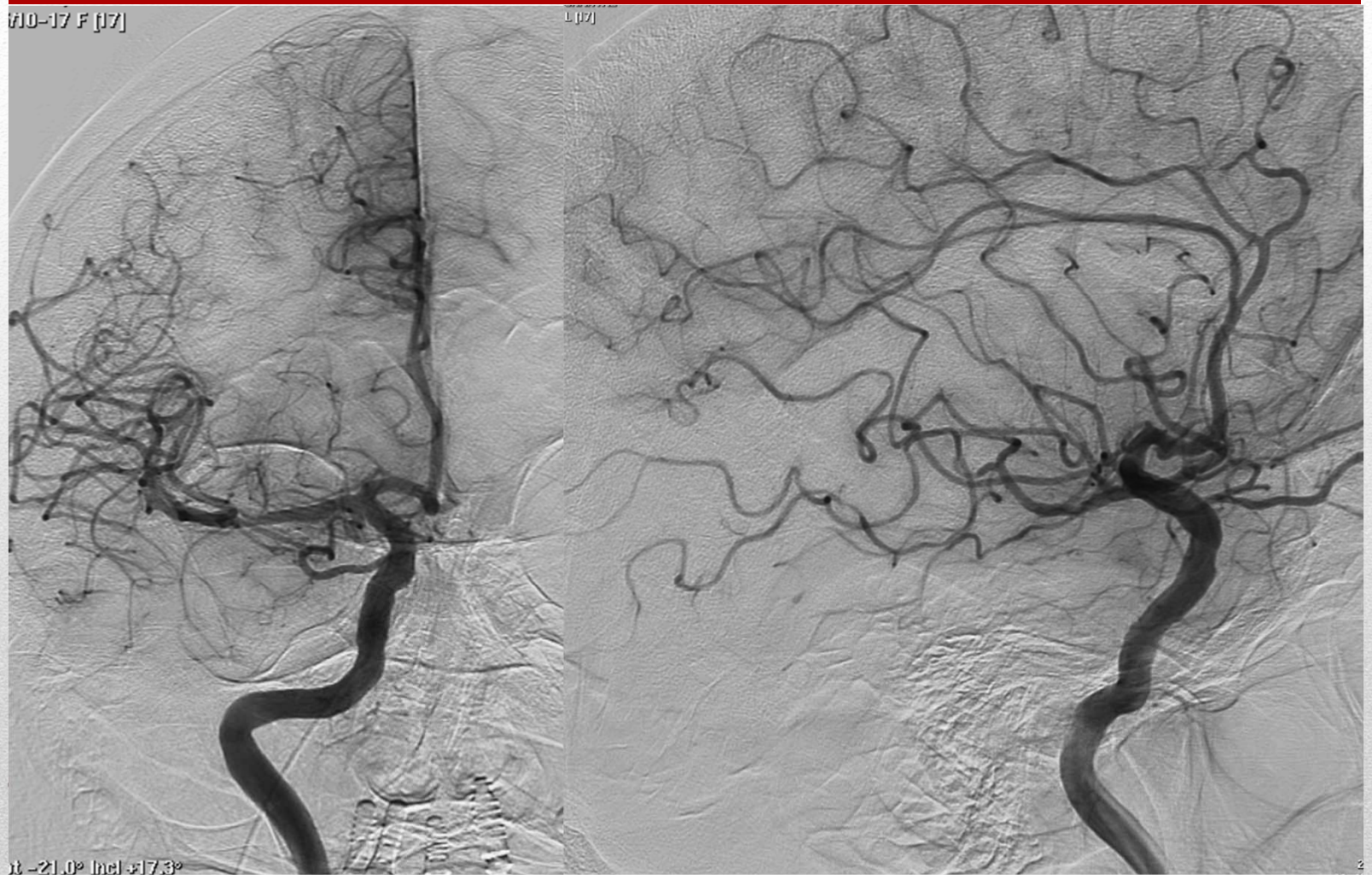

H
F

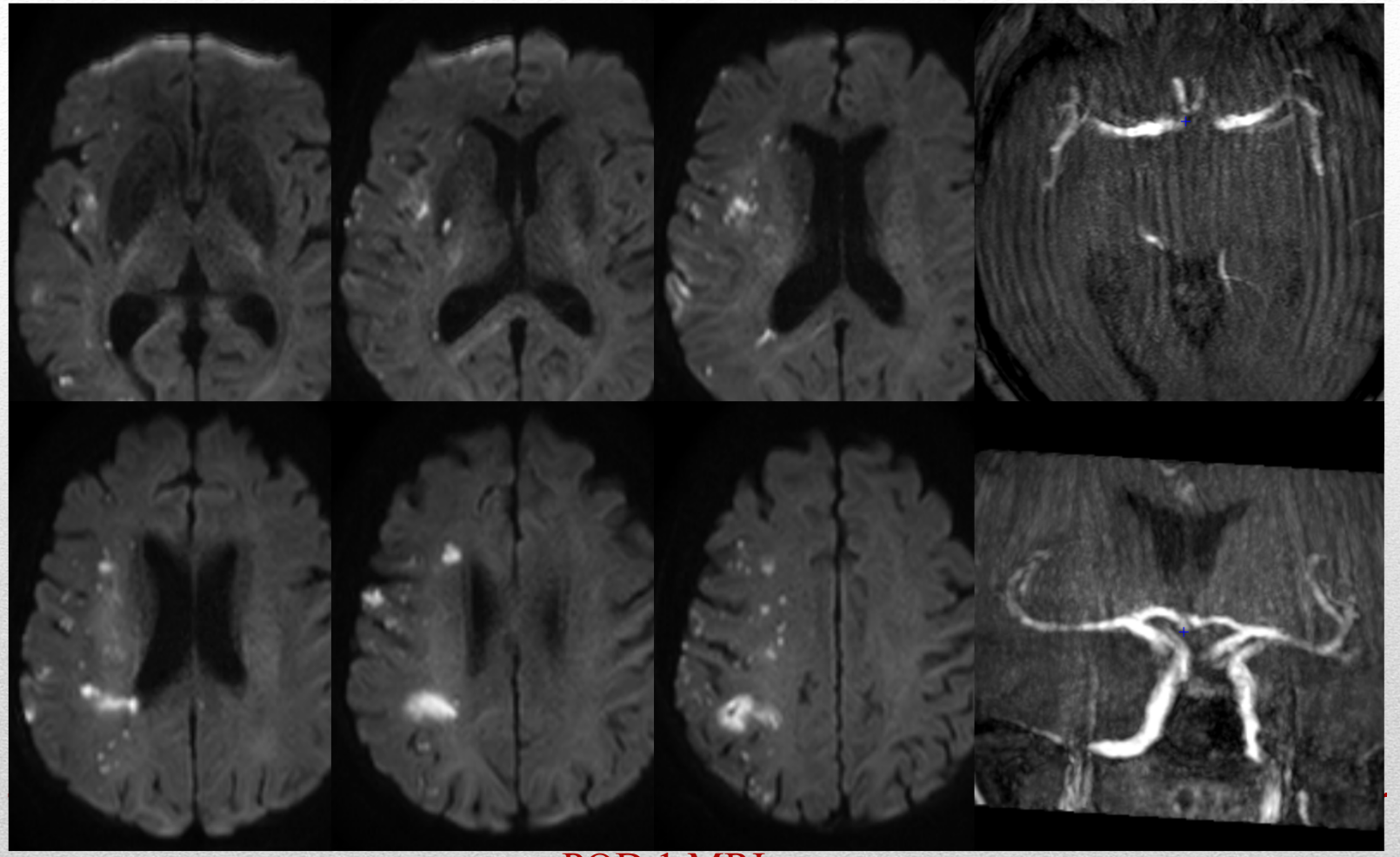

BGC
Trevo 6/25
19:54:23.6
03-févr.-2018
75 kV


After 1 Trevo pass
After 2 Trevo passes
Few min after

- Bolus of Abxicimab (0.25 mg/kg)
- Sofia 6+


0/20 F [2]
S20 ANGIOPLASTIE
0/20 L [2]
PTA w Gateway
1.5/9mm
20:45:31
03-févr.-20





POD 1 MRI

F/U

- NIHSS 7 at discharge
- 3 mo mRS 0
- Atheromatous occlusion of right M1 (smoking++)

NTRODUCTION: The use of coronary balloons in the cerebral vasculature is limited due to their poor trackability and increased risk of vessel injury. We report our experience using more compliant elastomer balloons for thrombus resistant to intraarterial (IA) pharmacological and mechanical thrombolysis in acute stroke. METHODS: We retrospectively analyzed 12 consecutive patients with an occluded intracranial artery treated with angioplasty using a low-pressure elastomer balloon. Angiograms were graded according to the Thrombolysis in Cerebral Infarction (TICI) and Qureshi grading systems. Outcomes were categorized as independent (modified Rankin scale, mRS, score <or=2), dependent (mRS score 3-5), or dead (mRS score 6). RESULTS: Included in the study were 12 patients (mean age 66+/-17 years, range 31-88 years; mean baseline National Institutes of Health stroke scale score 17+/-3, range 12-23). The occlusion sites were: internal carotid artery (ICA) terminus (five patients, including two concomitant cervical ICA occlusions), M1 segment (two patients), and basilar artery (two patients). Pharmacological treatment included intravenous (IV) t-PA only (two patients), IA urokinase only (nine patients), both IV t-PA and IA urokinase (one patient), and IV and/or IA eptifibatide (eight patients). Mean time to treatment was 5.9+/-3.9 h (anterior circulation) and 11.0+/-7.2 h (posterior circulation). Overall recanalization rate (TICI grade 2/3) was 91.6%. Procedure-related morbidity occurred in one patient (distal posterior inferior cerebellar artery embolus). There were no symptomatic hemorrhages. Outcomes at 90 days were independent (five patients), dependent (three patients) and dead (four patients, all due to progression of stroke with withdrawal of care). CONCLUSION: Angioplasty of acutely occluded intracranial arteries with low-pressure elastomer balloons results in high recanalization rates with an acceptable degree of safety. Prior use of thrombolytics may increase the chances of recanalization, and glycoprotein IIb-IIIa inhibitors may be helpful in preventing reocclusion and in increasing patency rates.

Neuroradiology. 2008 Apr;50(4):331-40. doi: 10.1007/s00234-007-0340-z. Epub 2008 Jan 3.

Low-pressure balloon angioplasty with adjuvant pharmacological therapy in patients with acute ischemic stroke caused by intracranial arterial occlusions.

Nogueira RG[1], Schwamm LH, Buonanno FS, Koroshetz WJ, Yoo AJ, Rabinov JD, Pryor JC, Hirsch JA.

Stent

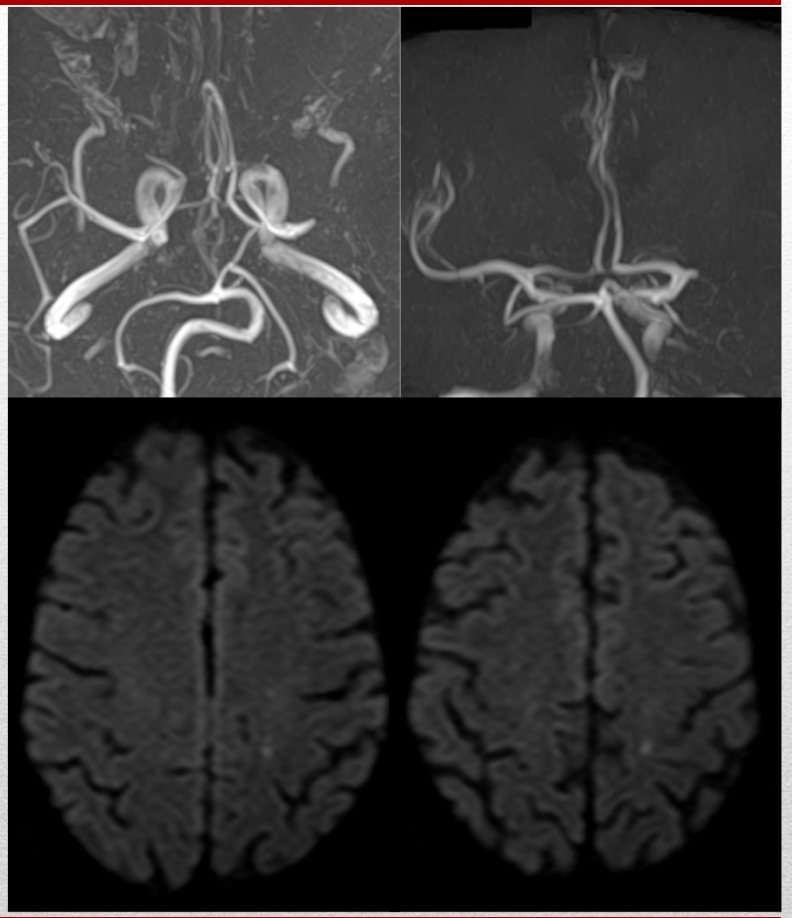
Abciximab

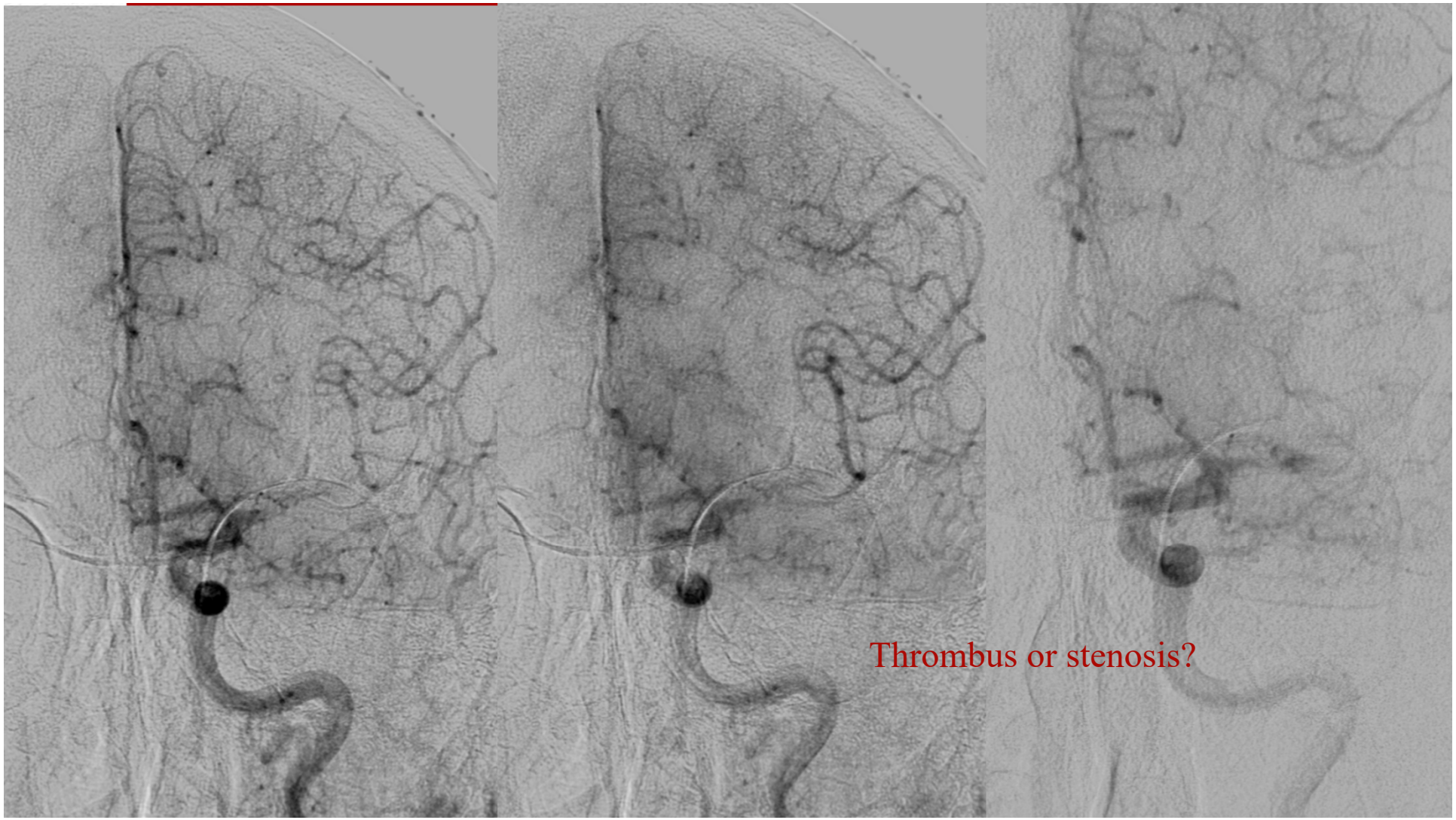
Stent

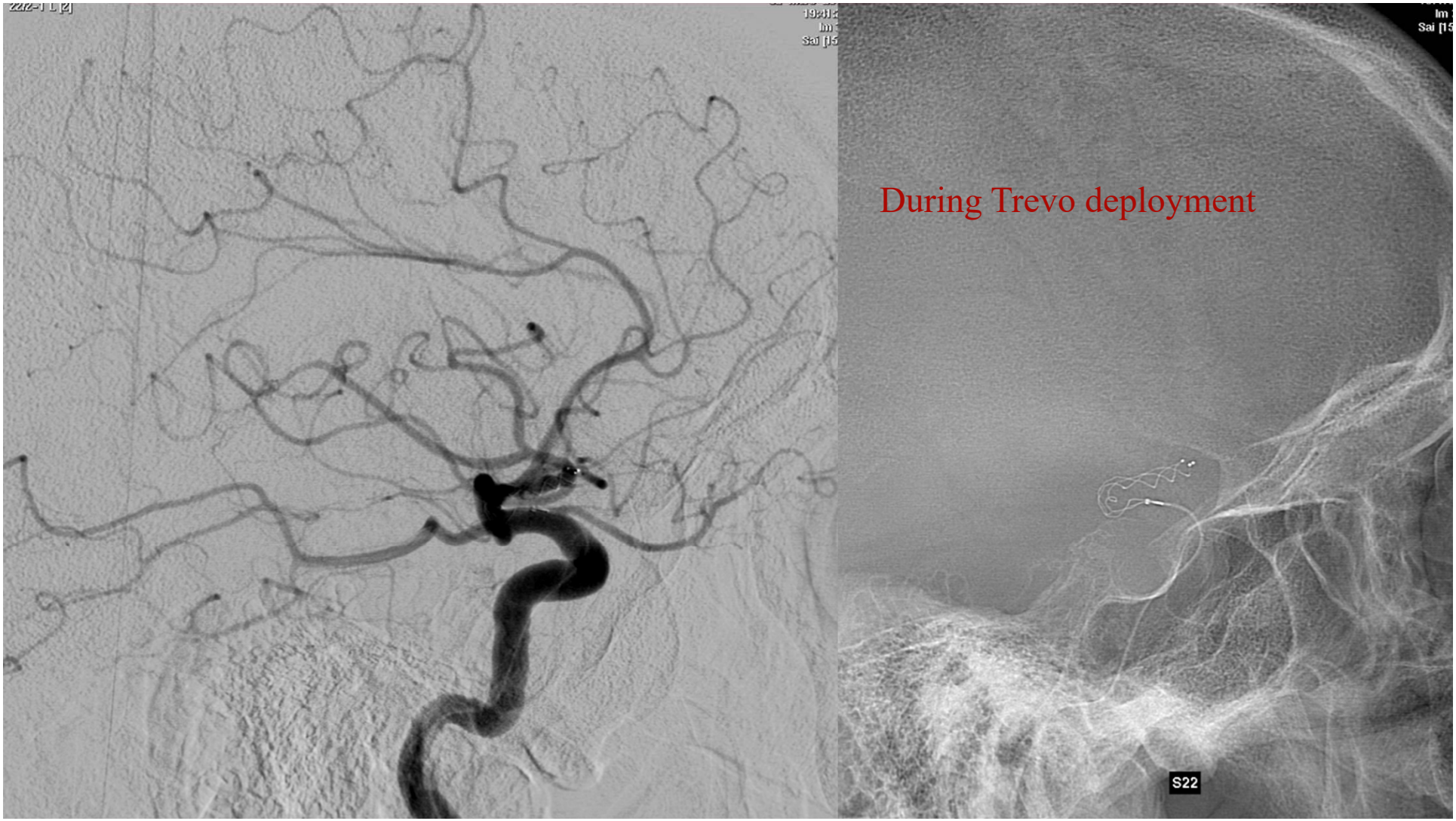
Pene Christian

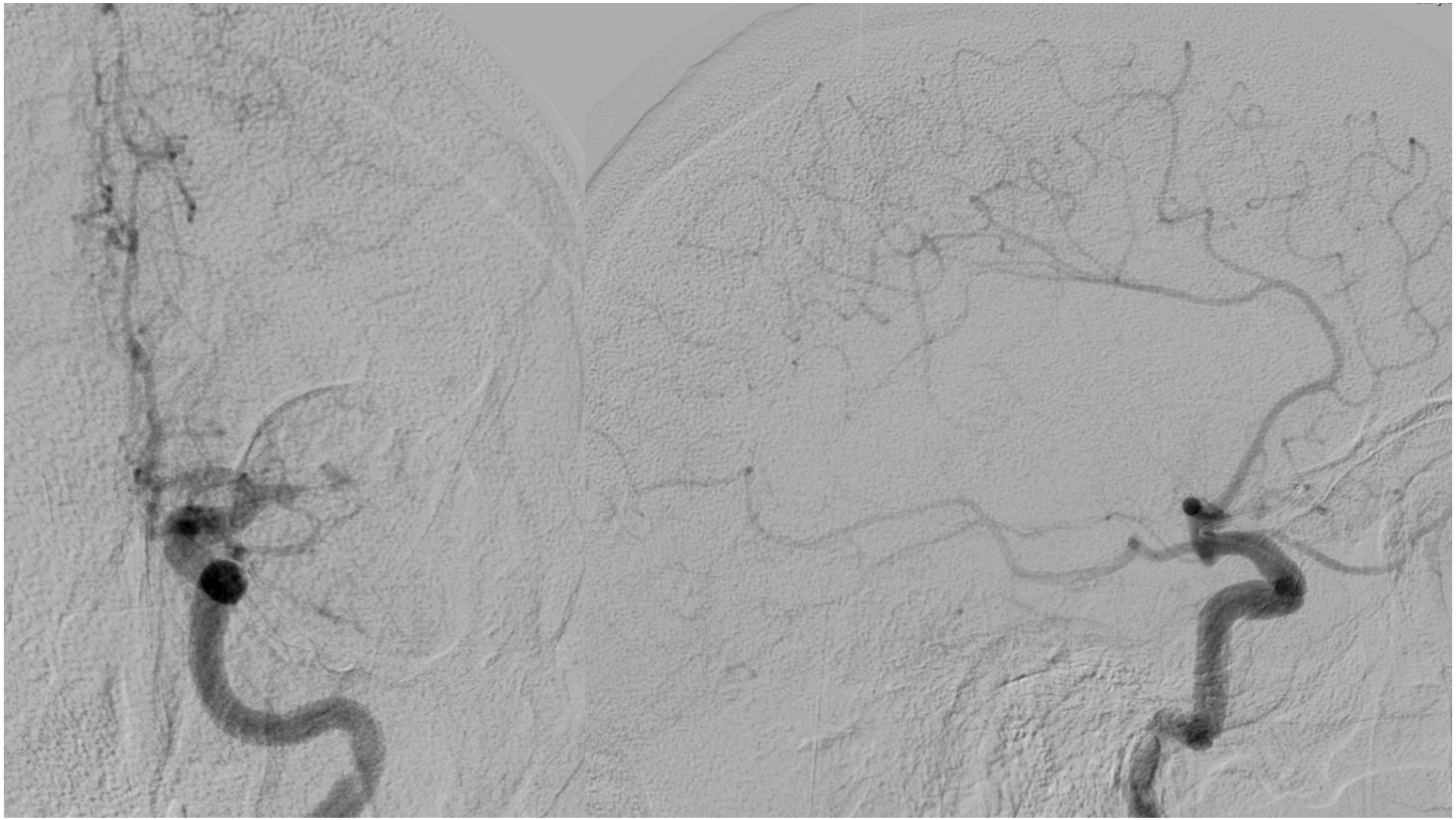
Metrics

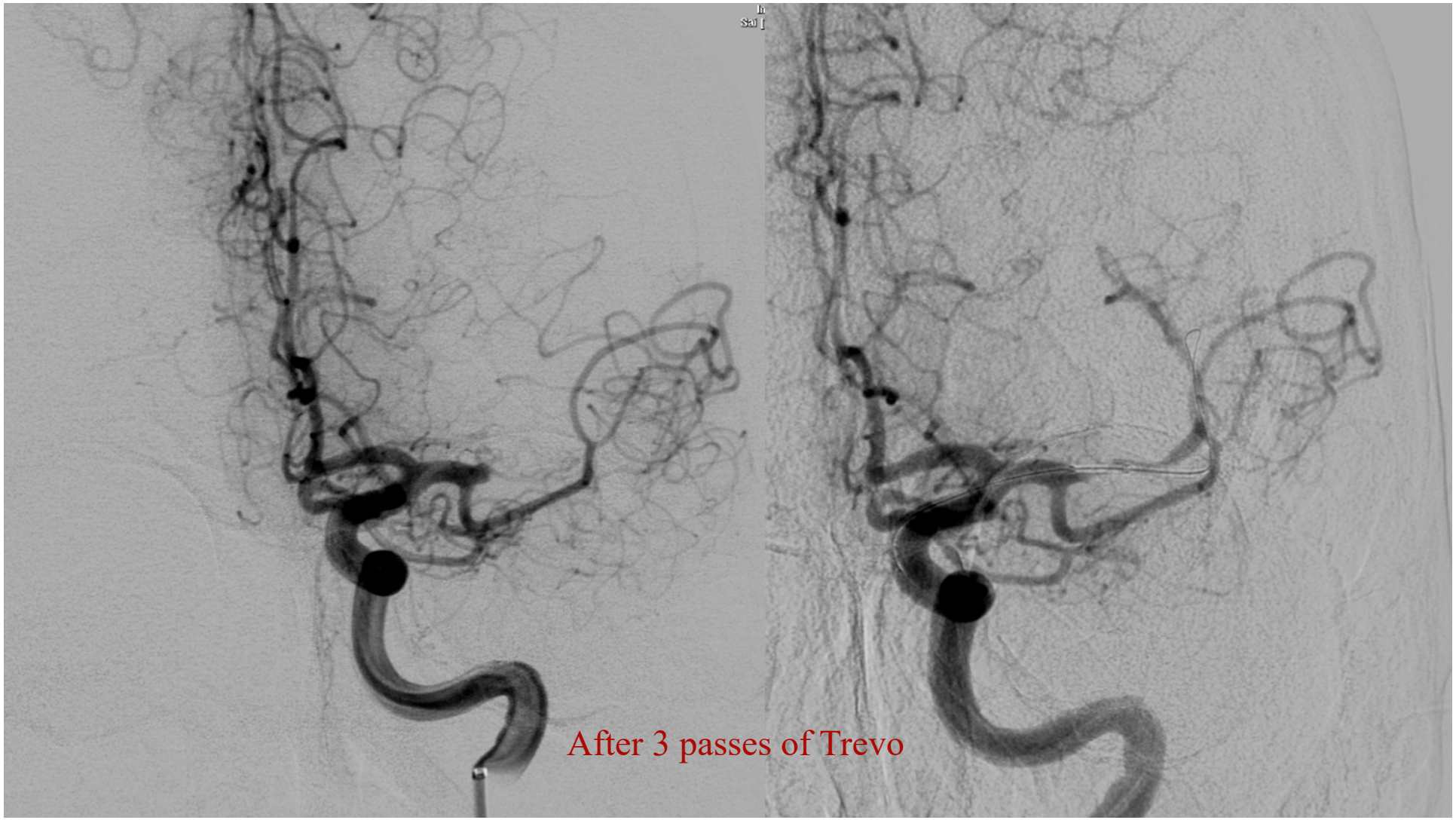
- M 75
- NIHSS 8
- Onset to MRI 170 min
- DWI-ASPECTS 9
- Onset to iv TPA 200 min
- Drip & Ship
- TOG 272 min

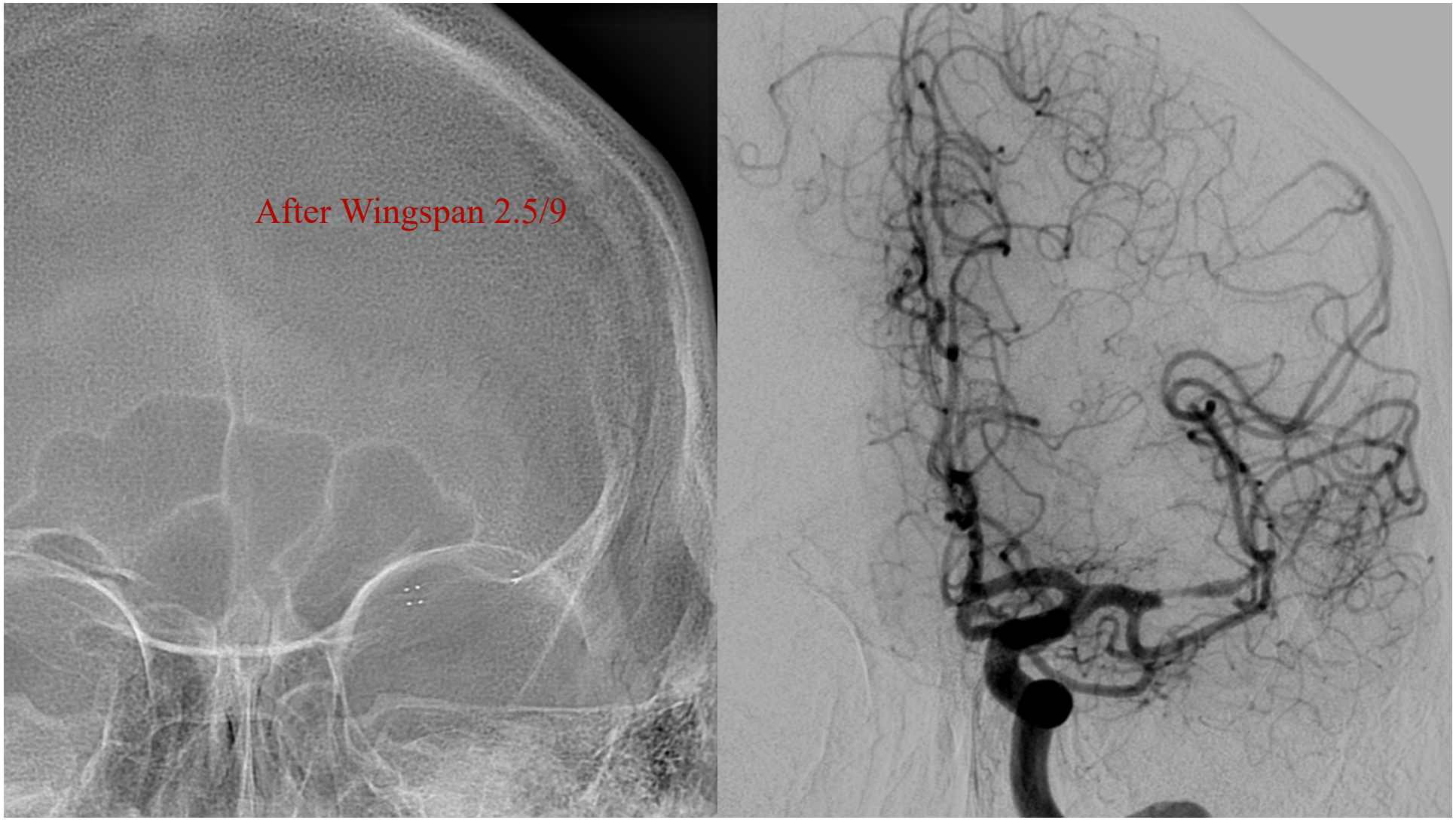


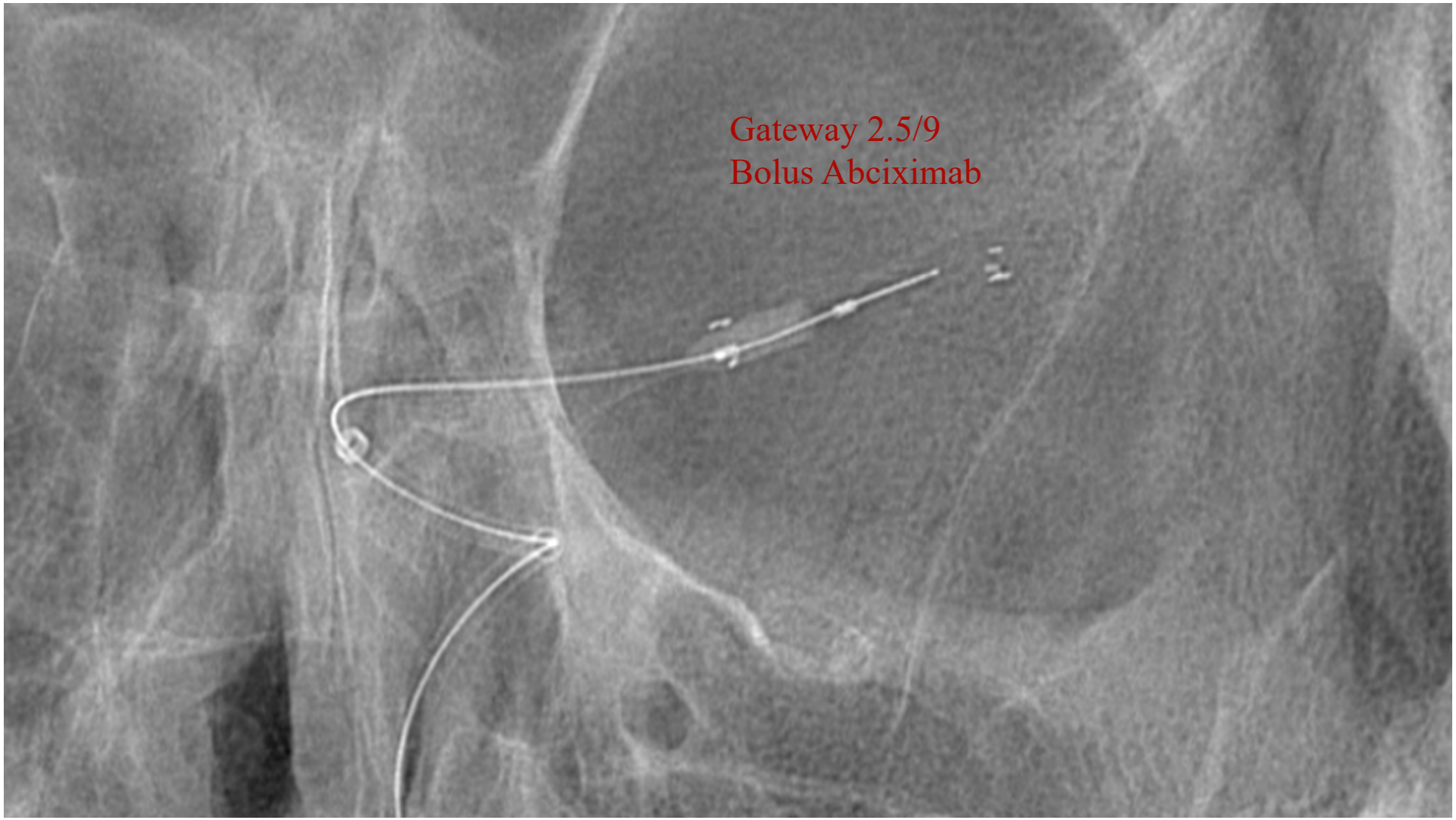

Thrombus or stenosis?

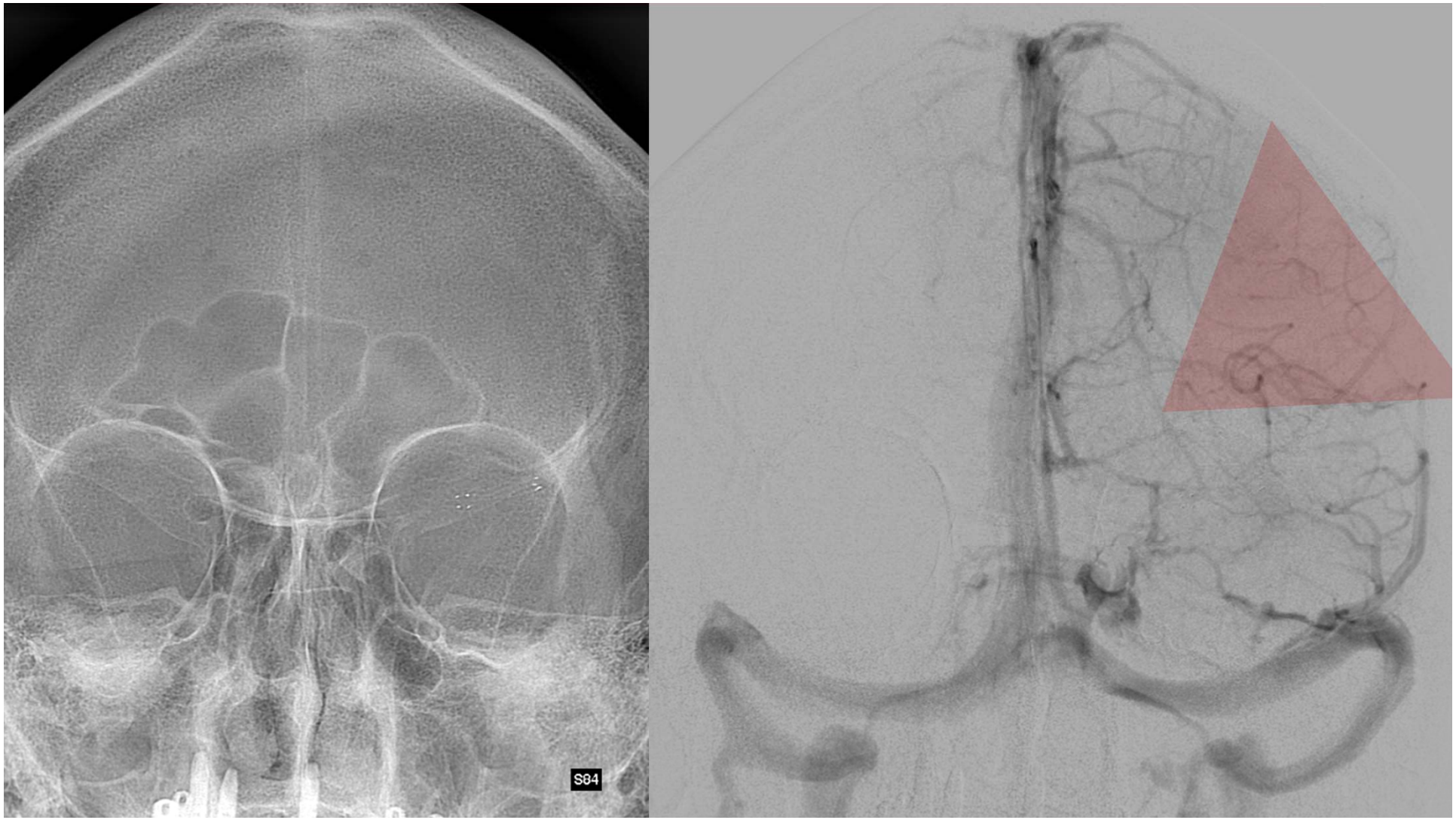

During Trevo deployment
S22

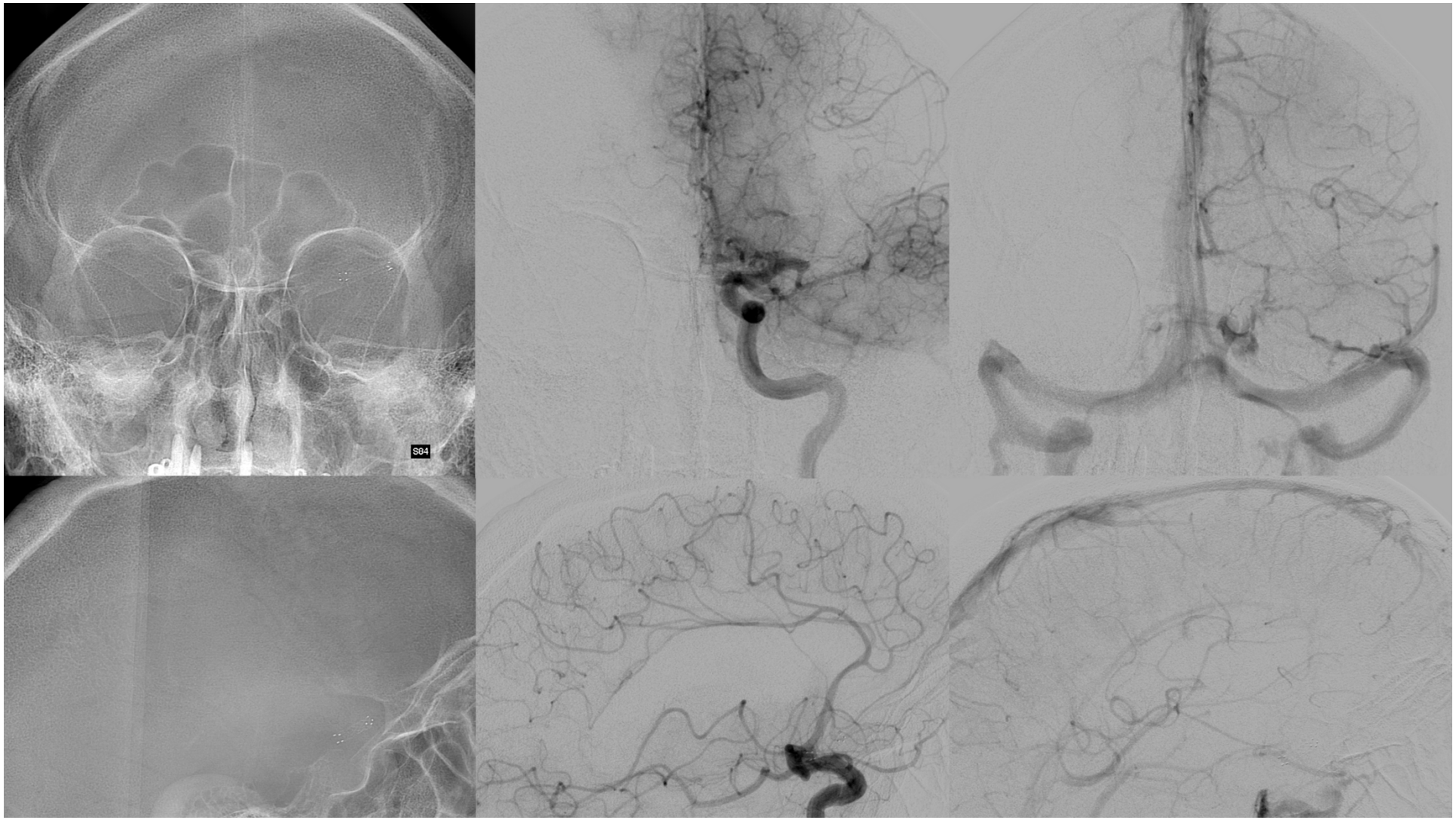


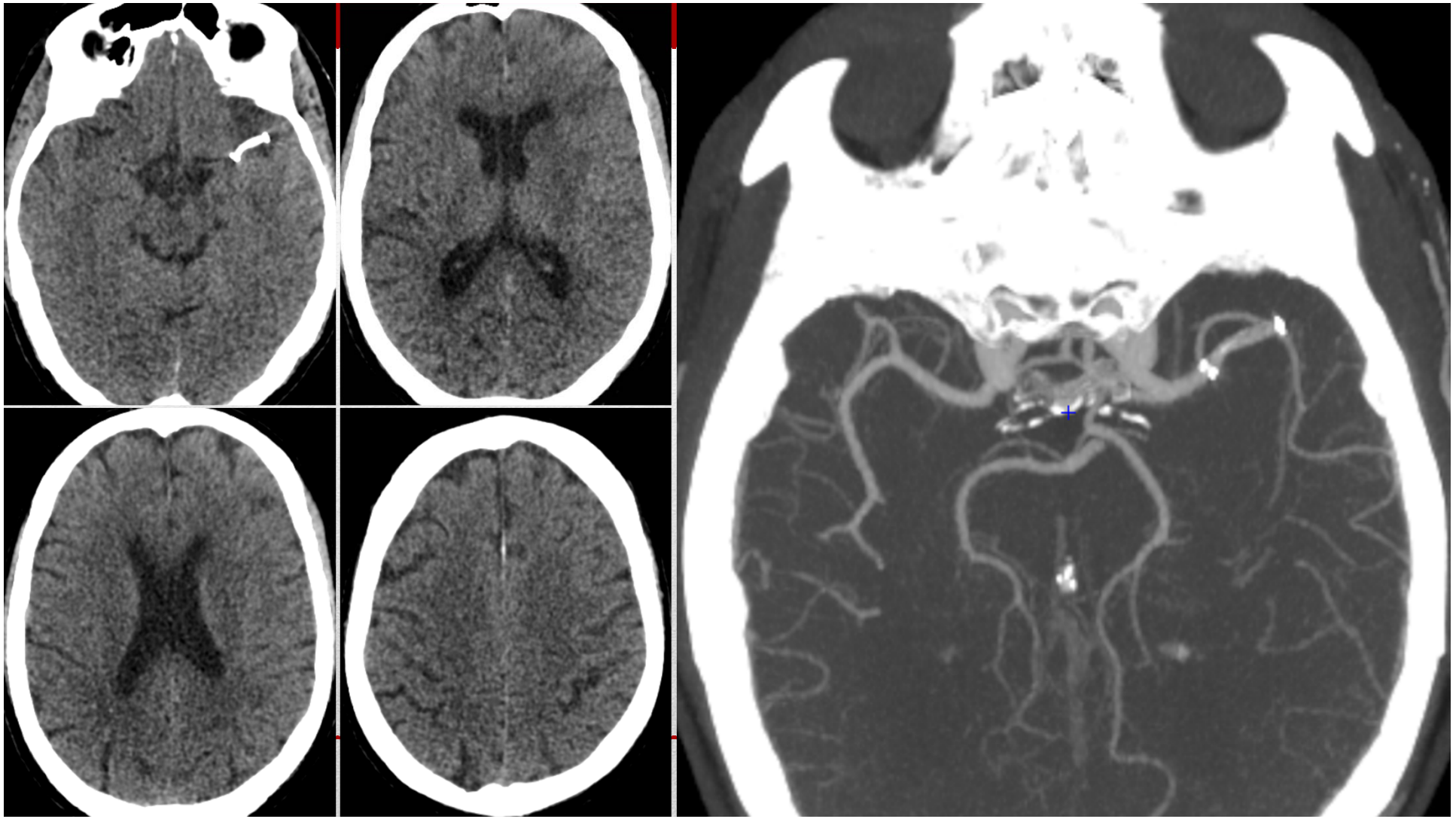

After 3 passes of Trevo


After Wingspan 2.5/9


Gateway 2.5/9
Bolus Abciximab


S04


S04



F/U

- Discharged NIHSS 4
- mRS 1 at 3 mo

Stent

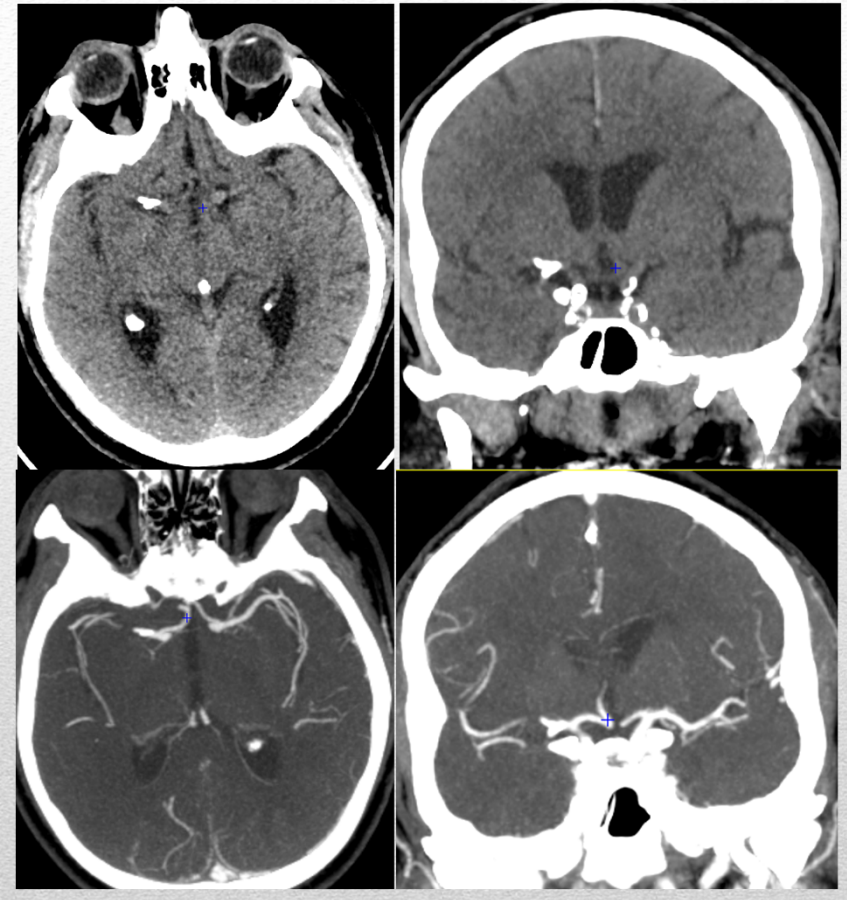
Abciximab

Stenting

Dufour Christian

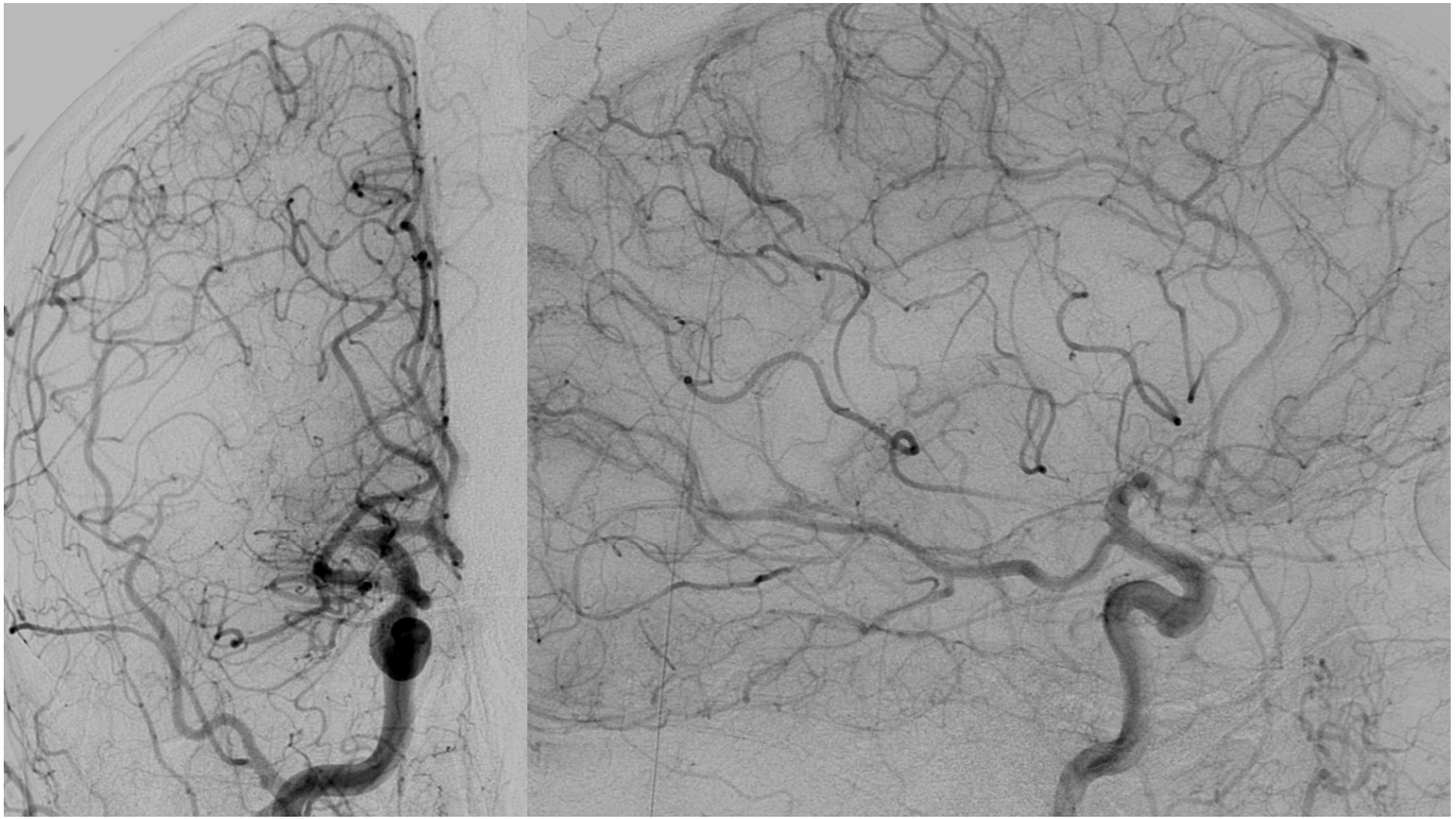
Metrics

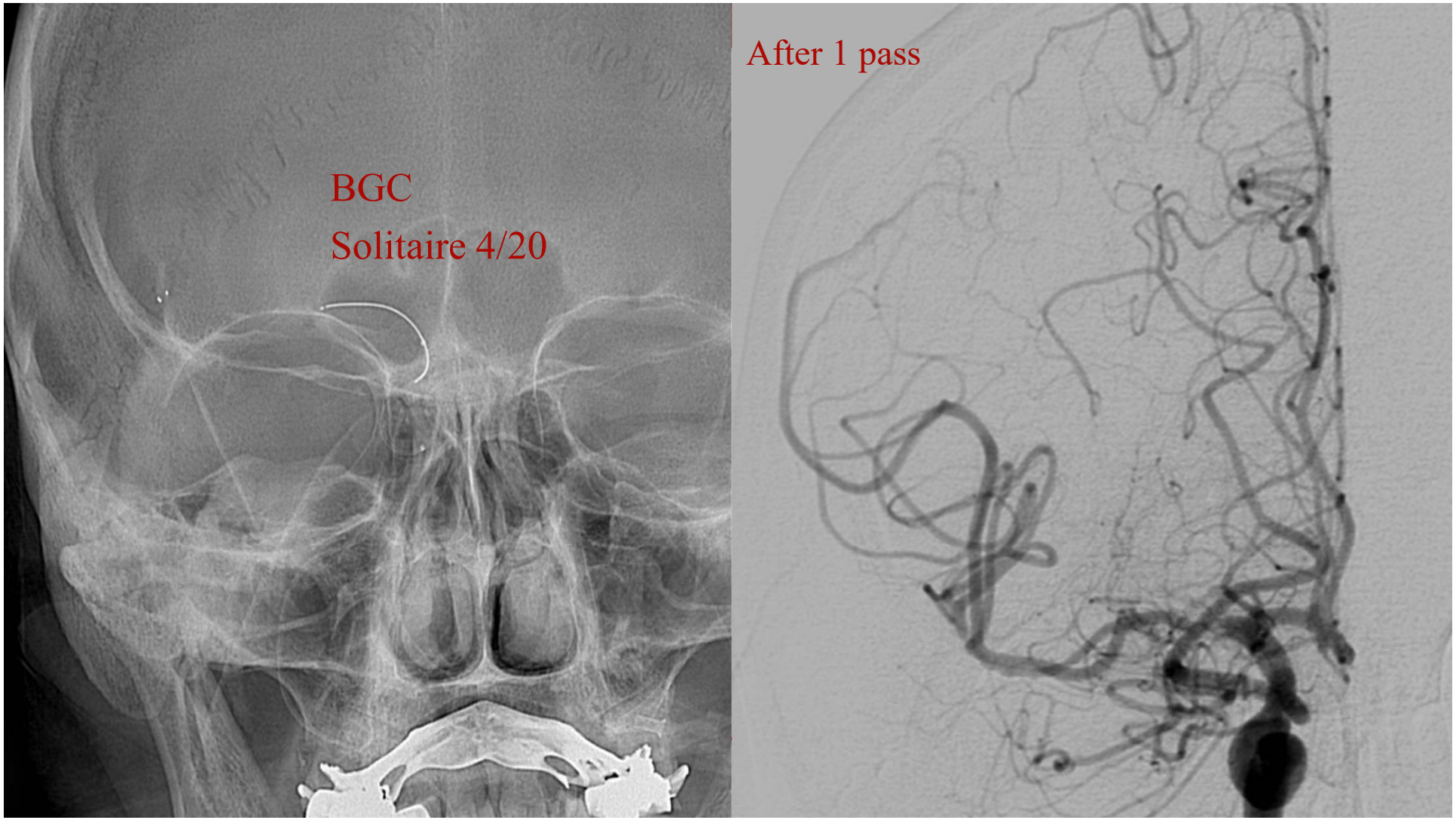
- F 67
- NIHSS 21
- CT + CTA 120 min
- iv TPA 145 min
- Drip & Ship
- TOG 225 min

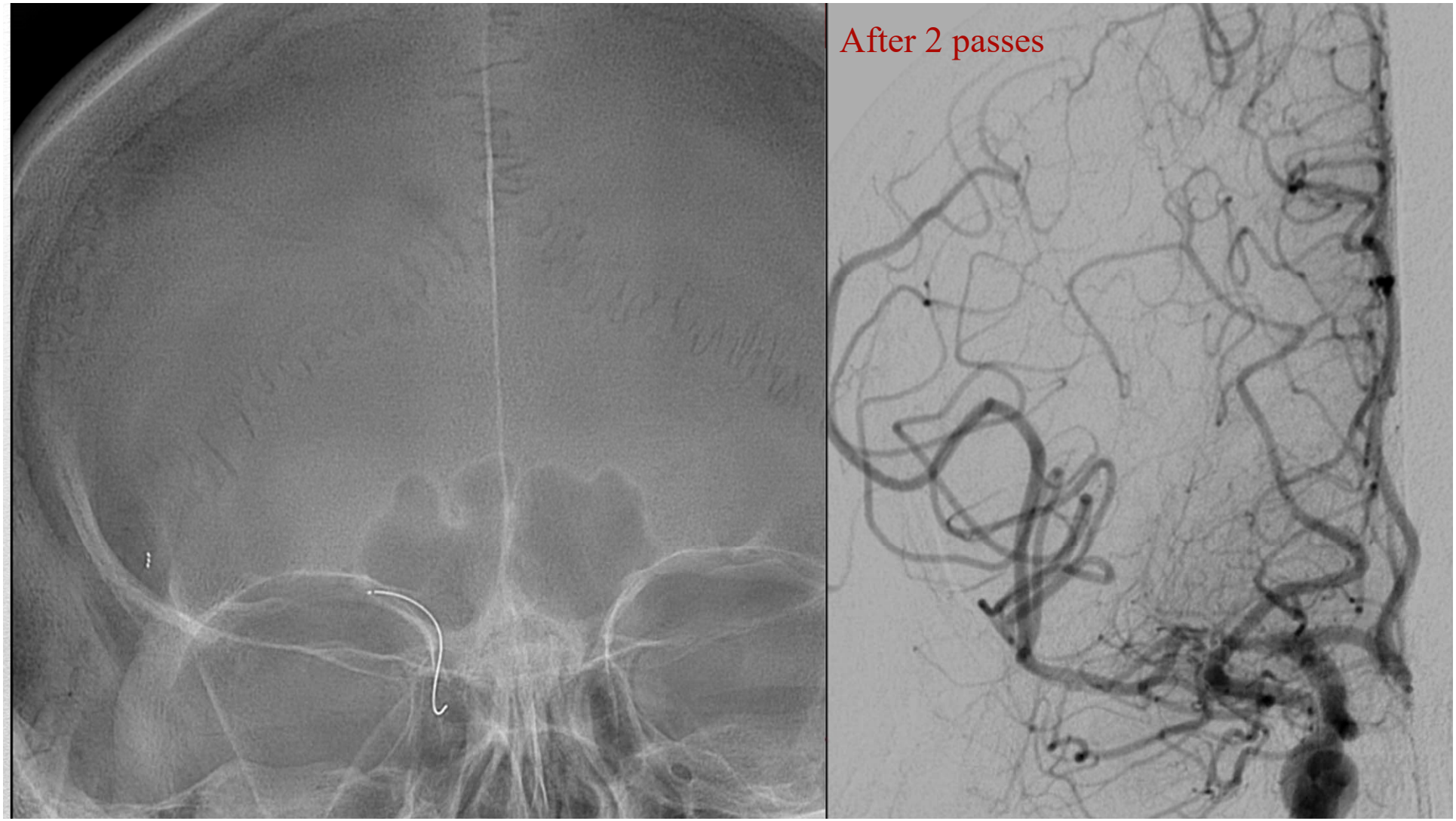


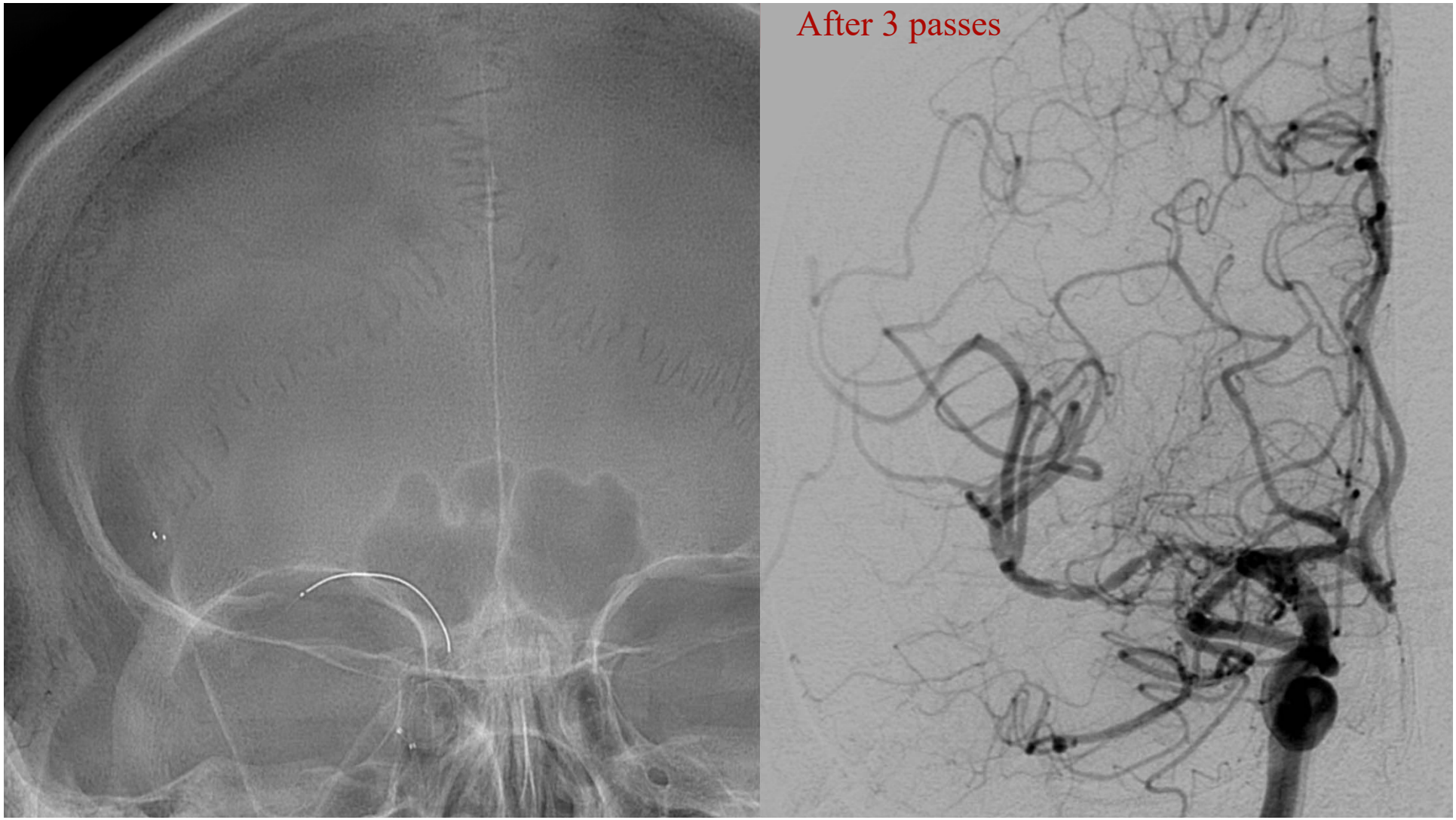
UECT

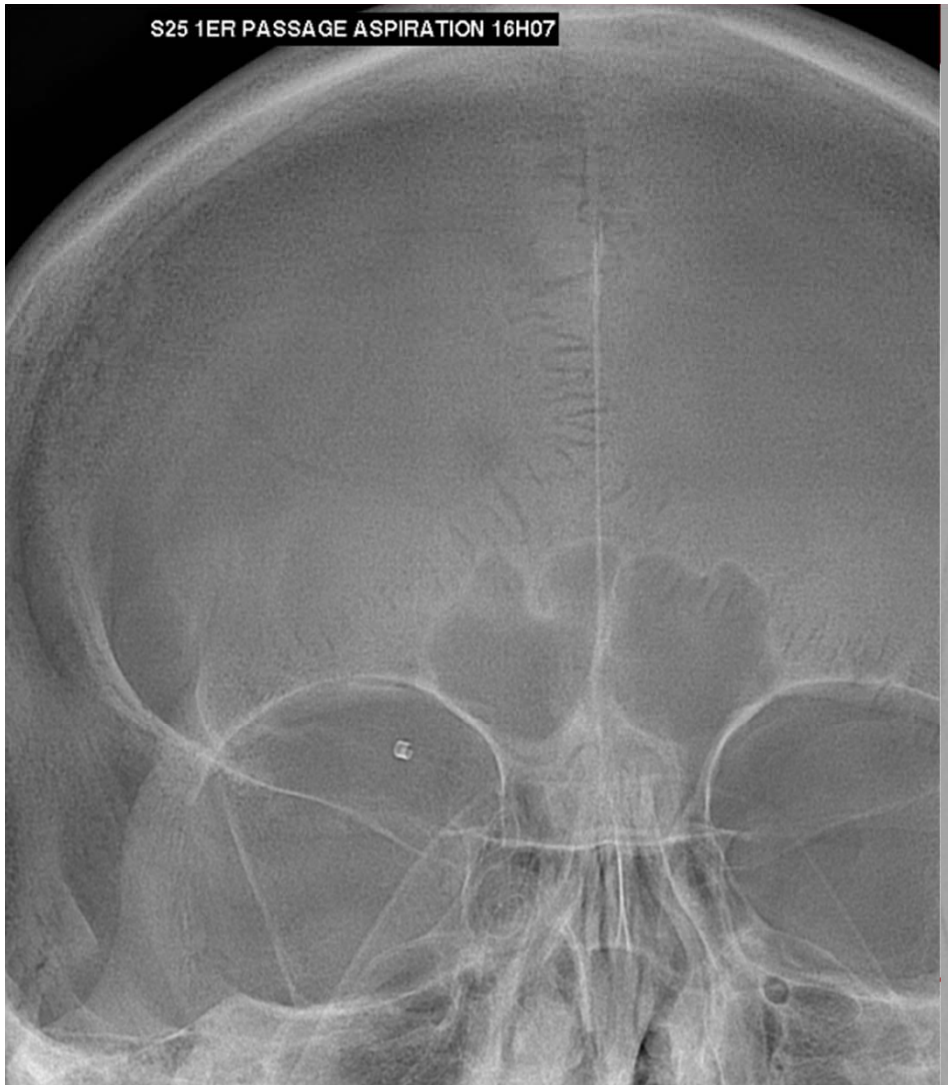
Angio CT



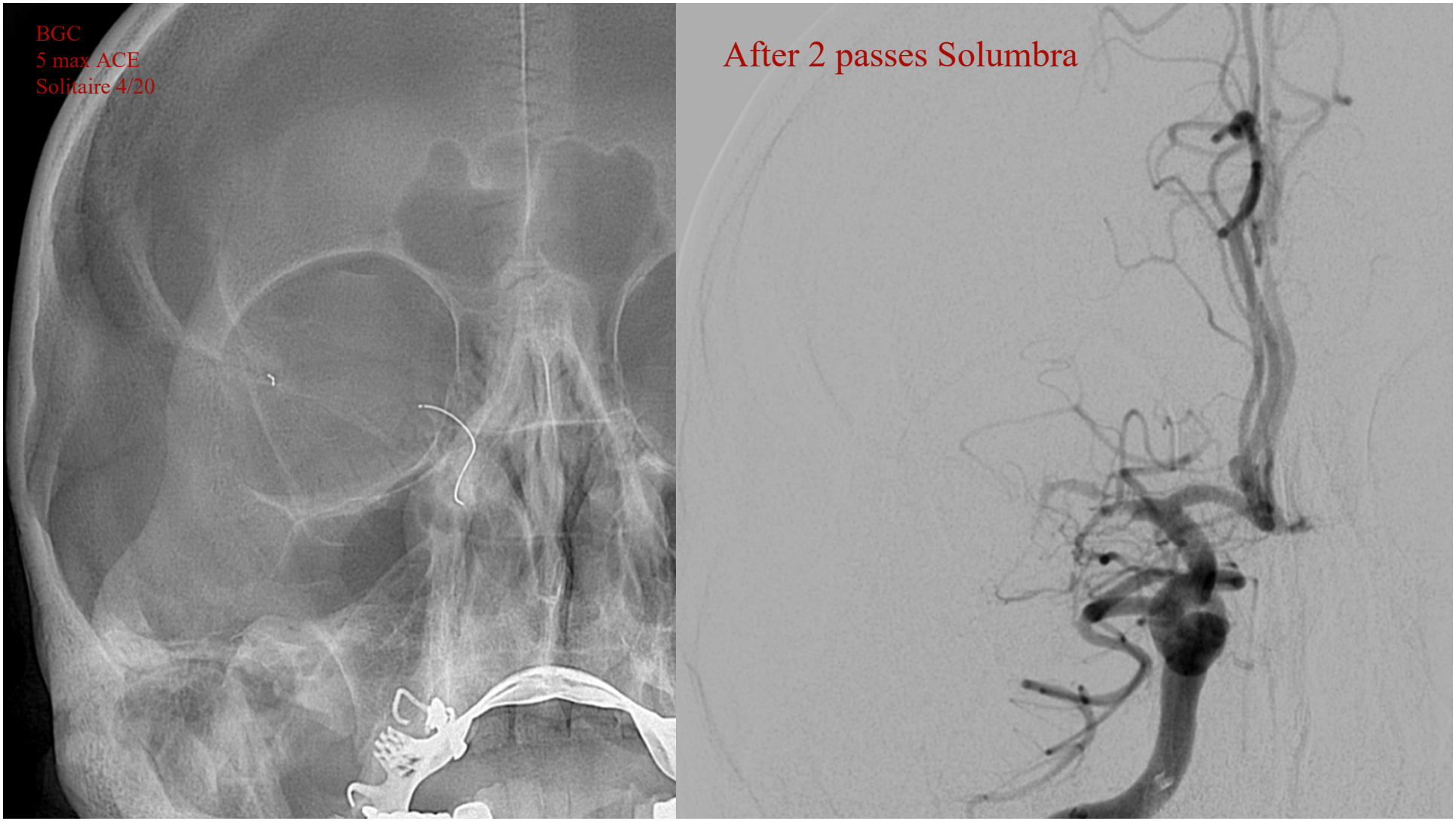

BGC
Solitaire 4/20
After 1 pass

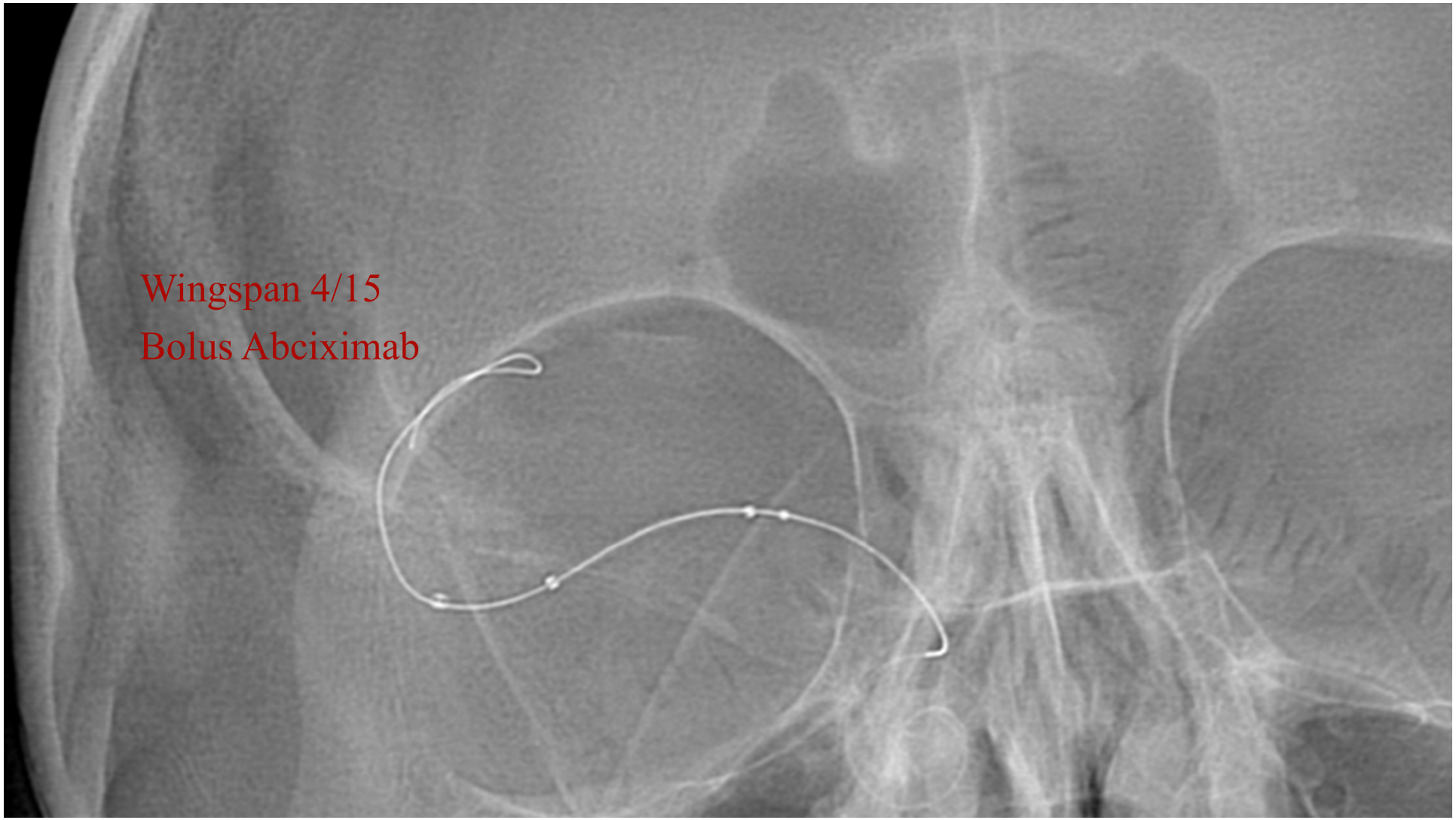

After 2 passes

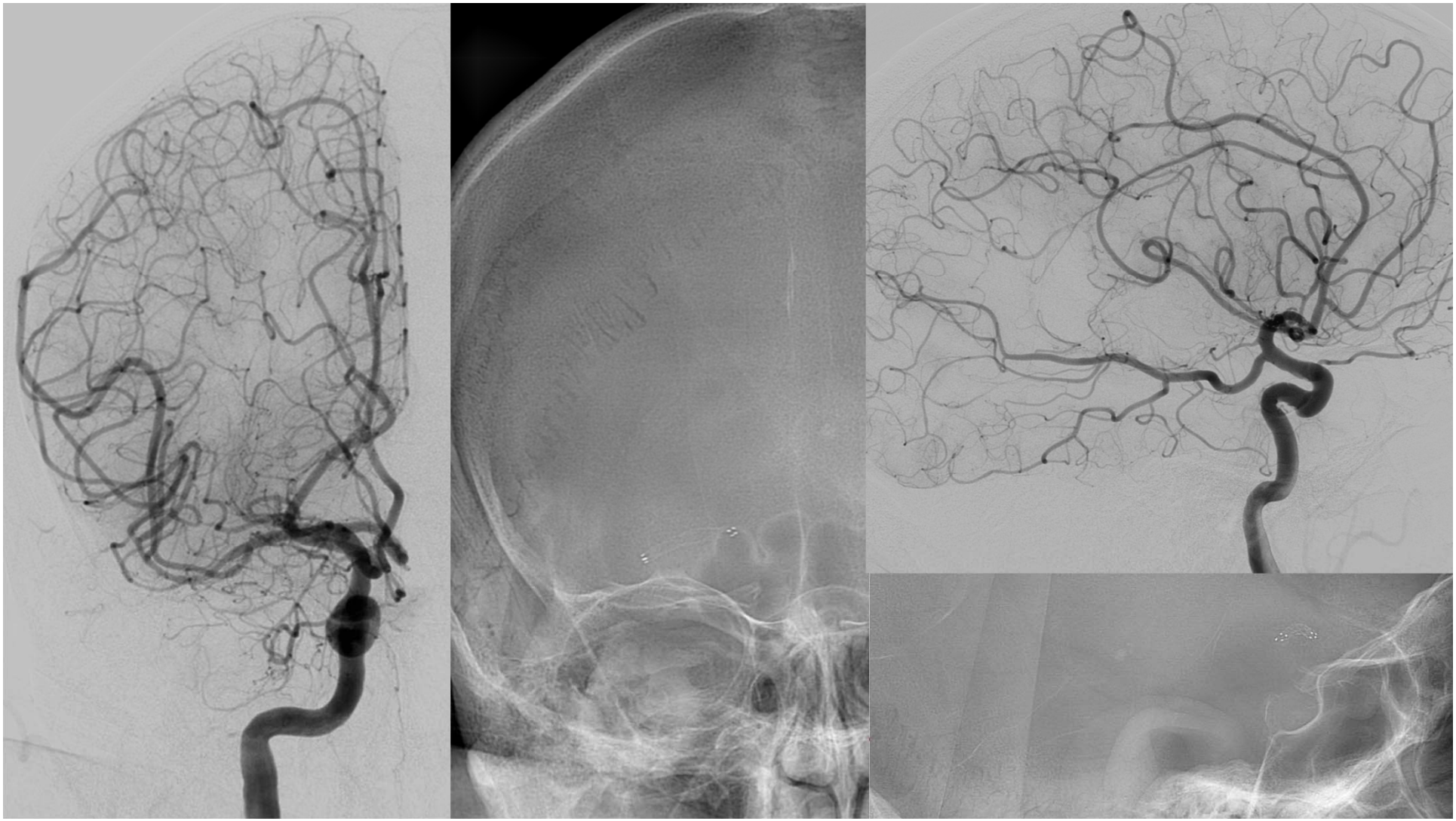

After 3 passes

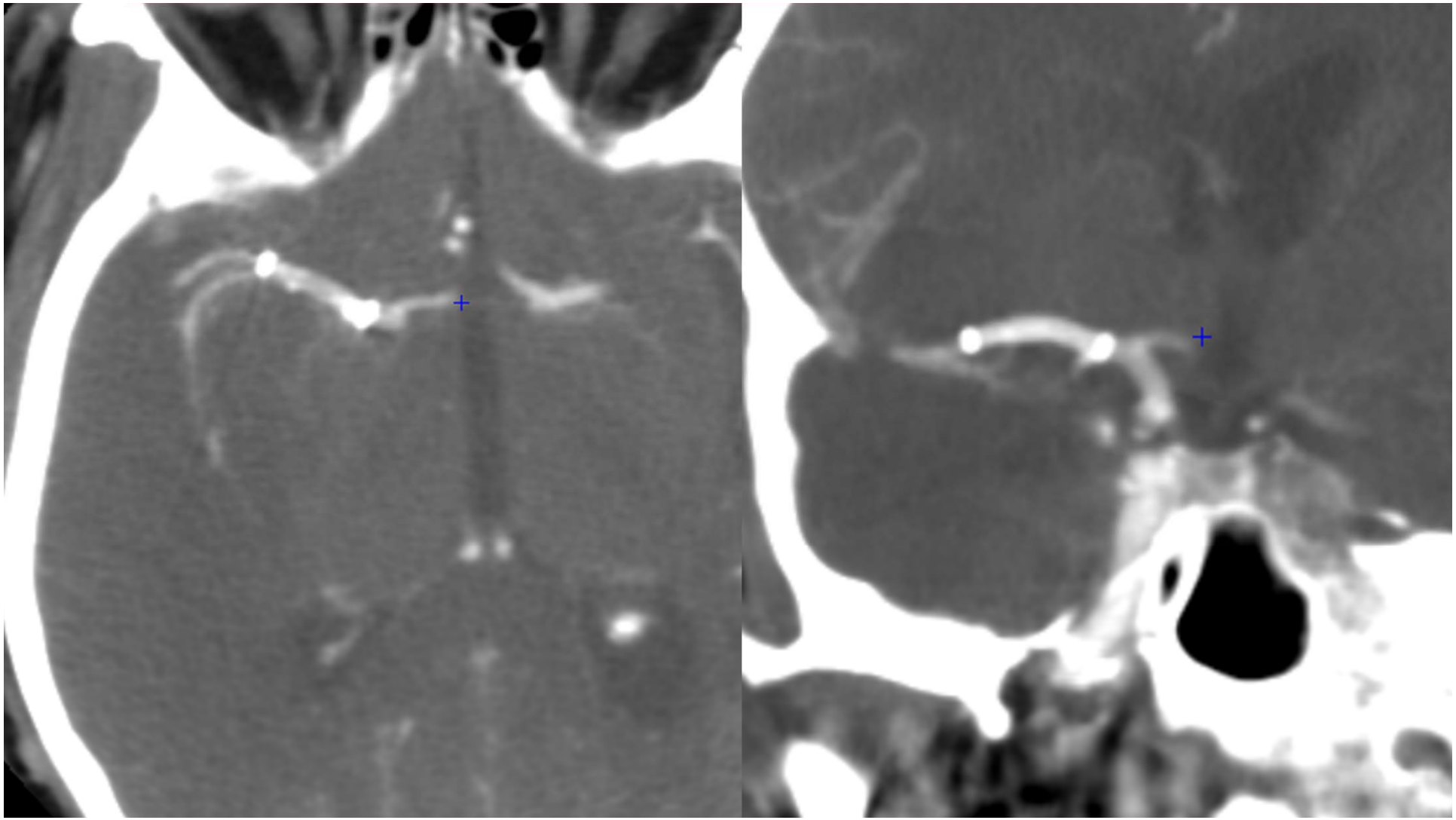

S25 1ER PASSAGE ASPIRATION 16H07

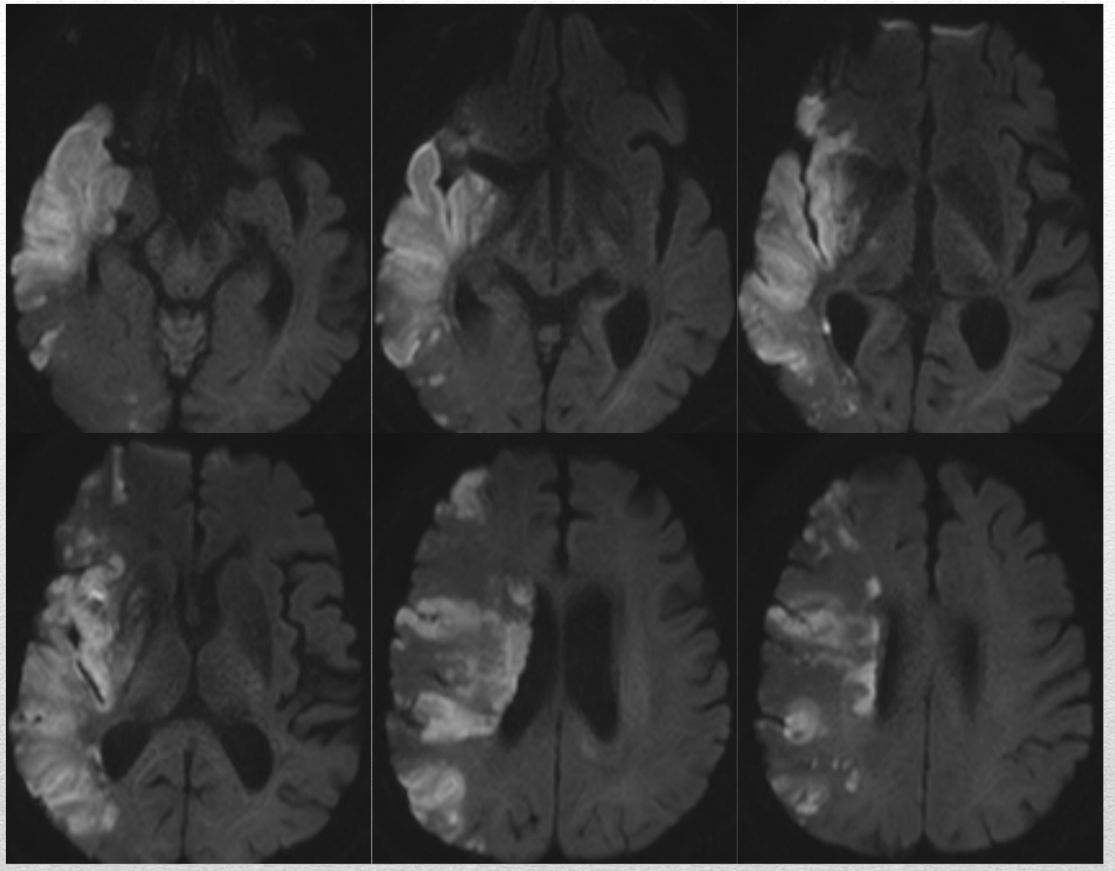

After Aspi 1 pass


BGC
5 max ACE
Solitaire 4/20
After 2 passes Solumbra

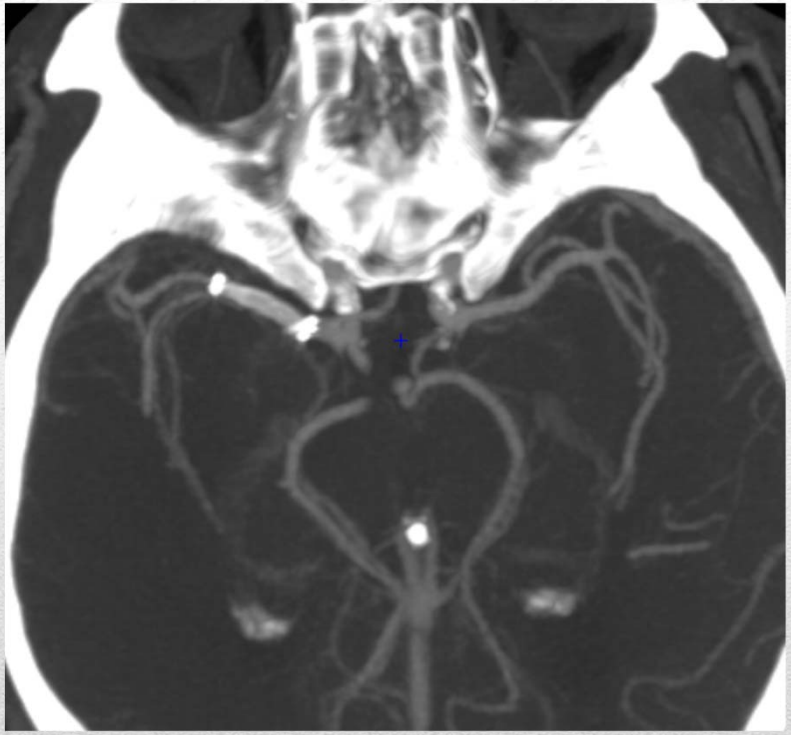

Wingspan 4/15
Bolus Abciximab

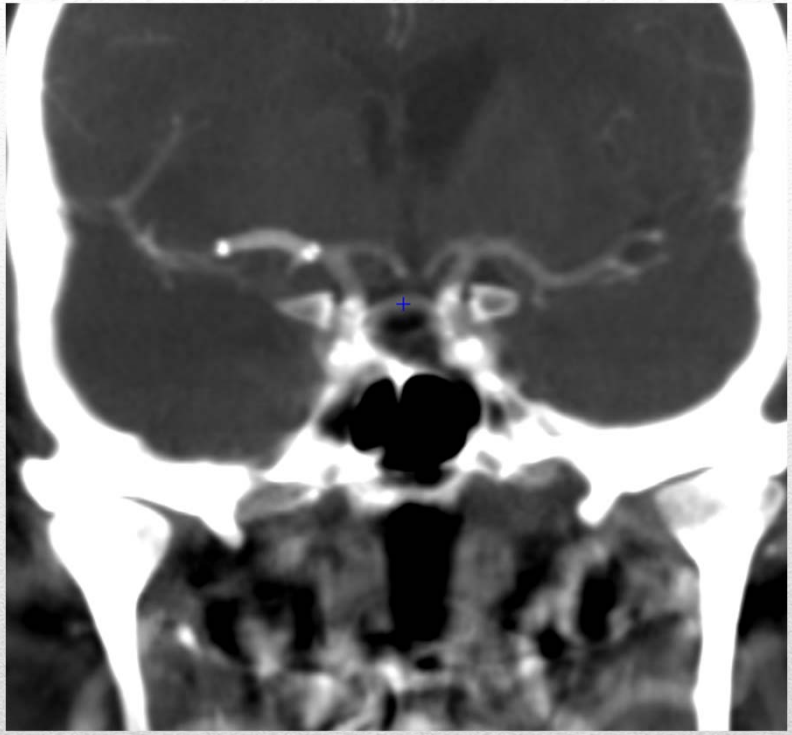




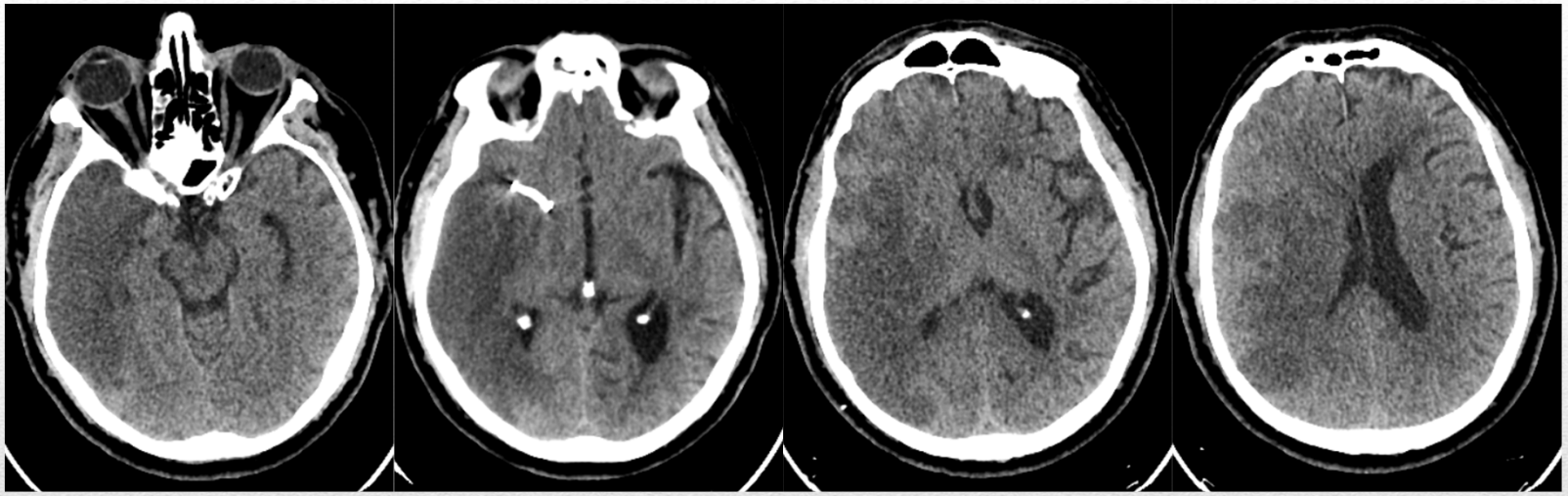


Post angioplasty MRI





POD 1 angio CT



- Discharge mRS 17
- 3 mo mRS 4

POD 2 CT scan

F/U

BACKGROUND AND PURPOSE: Effective rescue treatment has not yet been suggested in patients with mechanical thrombectomy (MT) failure. This study aimed to test whether rescue stenting (RS) improved clinical outcomes in MT-failed patients. METHODS: This is a retrospective analysis of the cohorts of the 16 comprehensive stroke centers between September 2010 and December 2015. We identified the patients who underwent MT but failed to recanalize intracranial internal carotid artery or middle cerebral artery M1 occlusion. Patients were dichotomized into 2 groups: patients with RS and without RS after MT failure. Clinical and laboratory findings and outcomes were compared between the 2 groups. It was tested whether RS is associated with functional outcome. RESULTS: MT failed in 148 (25.0%) of the 591 patients with internal carotid artery or middle cerebral artery M1 occlusion. Of these 148 patients, 48 received RS (RS group) and 100 were left without further treatment (no stenting group). Recanalization was successful in 64.6% (31 of 48 patients) of RS group. Compared with no stenting group, RS group showed a significantly higher rate of good outcome (modified Rankin Scale score, 0-2; 39.6% versus 22.0%; P=0.031) without increasing symptomatic intracranial hemorrhage (16.7% versus 20.0%; P=0.823) or mortality (12.5% versus 19.0%; P=0.360). Of the RS group, patients who had recanalization success had 54.8% of good outcome, which is comparable to that (55.4%) of recanalization success group with MT**. RS remained independently associated with good outcome after adjustment of other factors (odds ratio, 3.393; 95% confidence interval, 1.192-9.655; P=0.022).** Follow-up vascular imaging was available in the 23 (74.2%) of 31 patients with recanalization success with RS. The stent was patent in 20 (87.0%) of the 23 patients. **Glycoprotein IIb/IIIa inhibitor was significantly associated with stent patency but not with symptomatic intracranial hemorrhage**. CONCLUSIONS: RS was independently associated with good outcomes without increasing symptomatic intracranial hemorrhage or mortality. RS seemed considered in MT-failed internal carotid artery or middle cerebral artery M1 occlusion.

Rescue Stenting for Failed Mechanical Thrombectomy in Acute Ischemic Stroke

A Multicenter Experience

Yoonkyung Chang, MD; Byung Moon Kim, MD; Oh Young Bang, MD; Jang-Hyun Baek, MD; Ji Hoe Heo, MD; Hyo Suk Nam, MD; Young Dae Kim, MD; Joonsang Yoo, MD; Dong Joon Kim, MD; Pyoung Jeon, MD; Seung Kug Baik, MD; Sang Hyun Suh, MD; Kyung-Yul Lee, MD; Hyo Sung Kwak, MD; Hong Gee Roh, MD; Young-Jun Lee, MD; Sang Heum Kim, MD; Chang-Woo Ryu, MD; Yon-Kwon Ihn, MD; Byungjun Kim, MD; Hong Jun Jeon, MD; Jin Woo Kim, MD; Jun Soo Byun, MD; Sangil Suh, MD; Jeong Jin Park, MD; Woong Jae Lee, MD, PhD; Jieun Roh, MD; Byoung-Soo Shin, MD; Jeong-Min Kim, MD

Stroke. 2018 Apr;49(4):958-964.

AntiGp2b3a

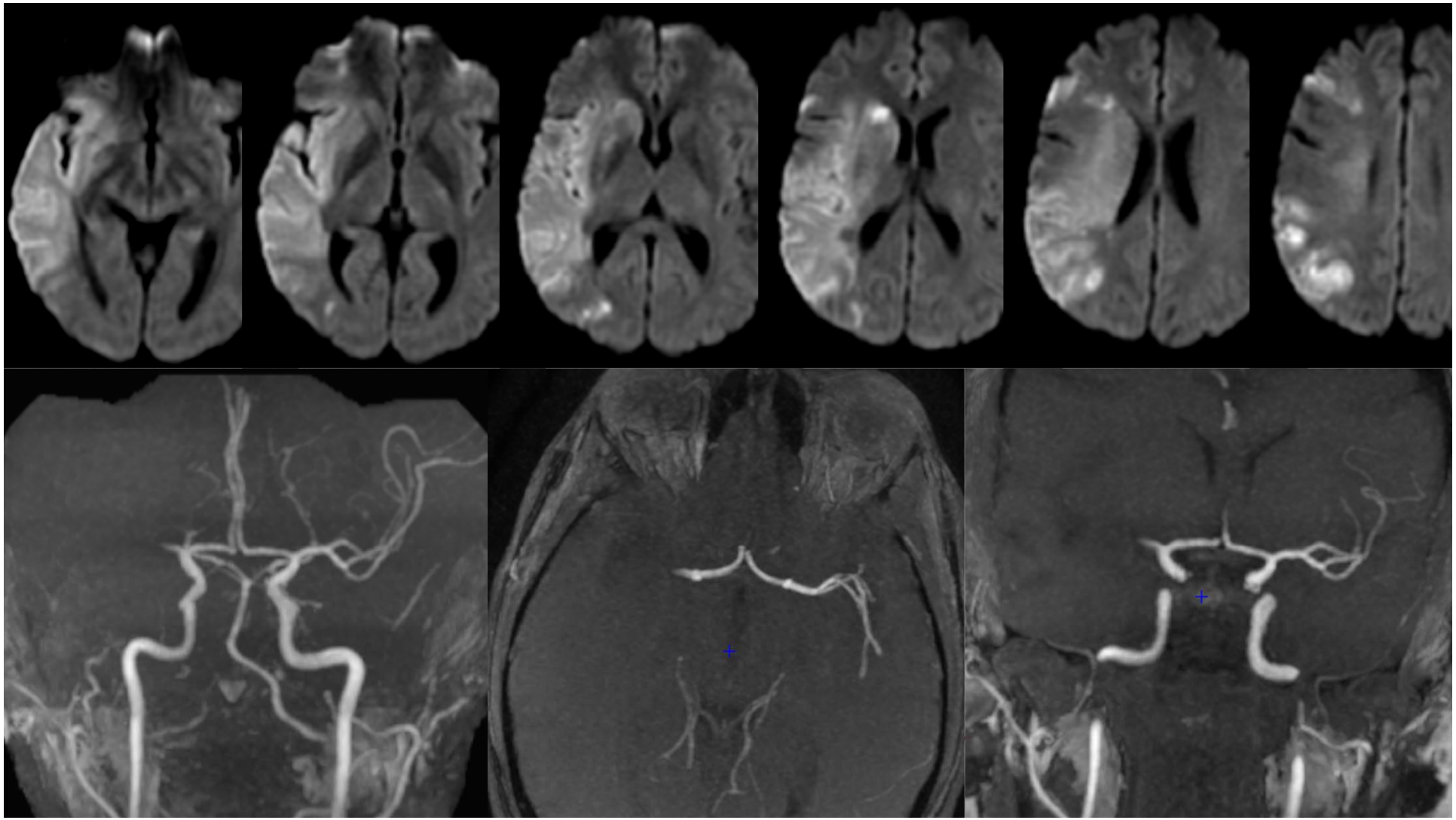
Nimodipin

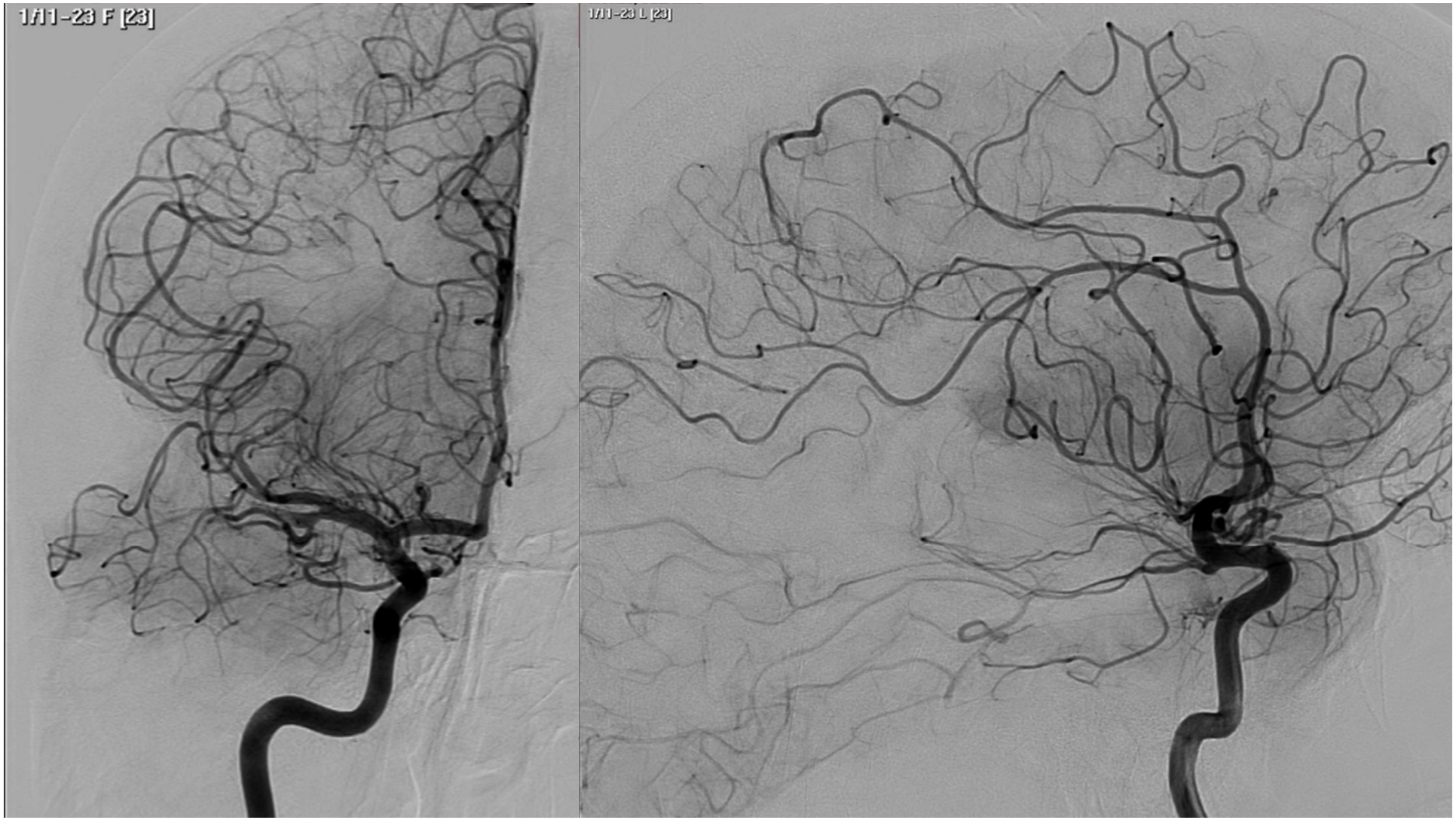
Abciximab

Morel Delphine

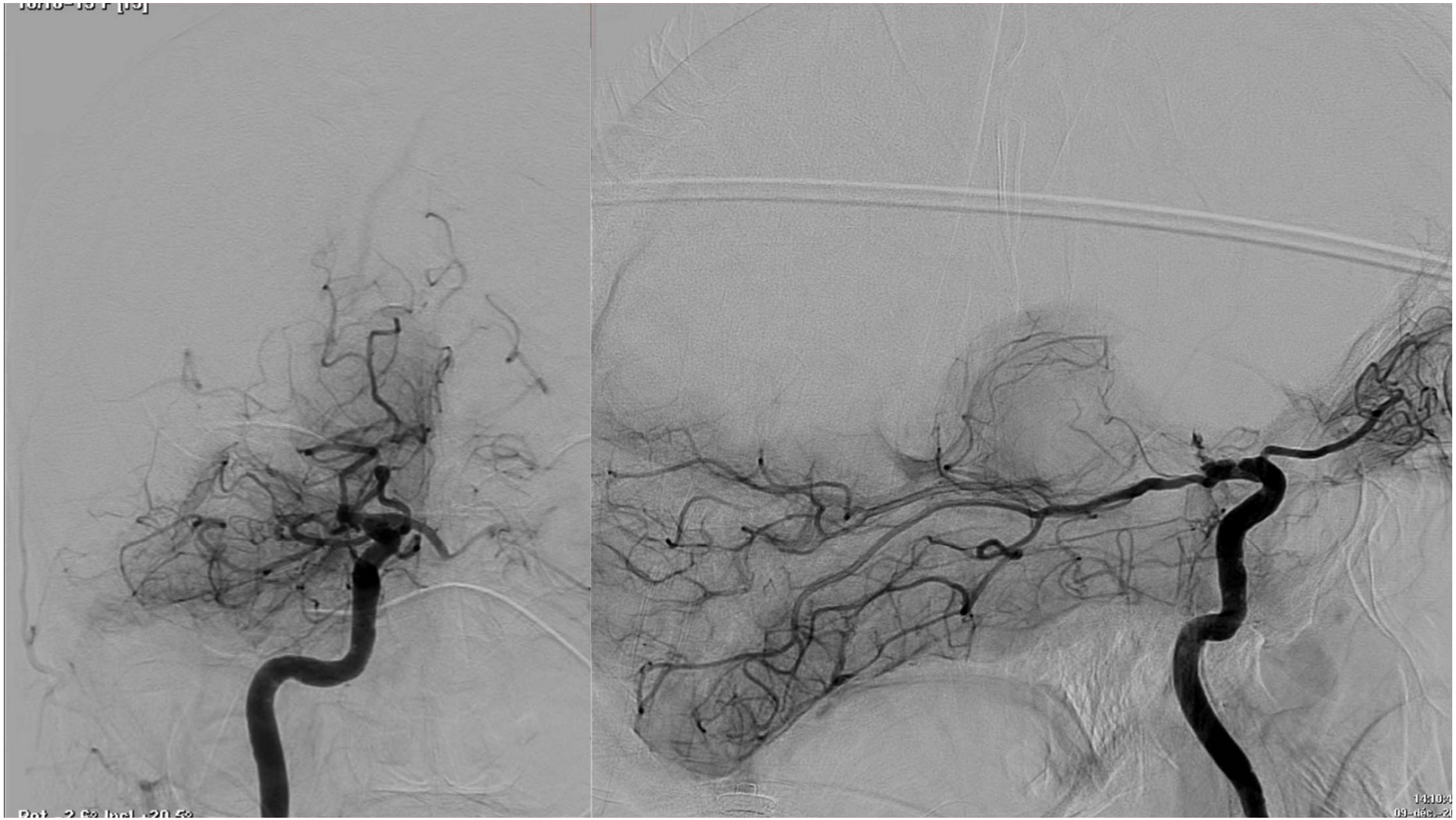
- F 35
- Thunderclap HA
- NIHSS 16
- MRI 110 min
- DWI-ASPECT 3
- iv TPA 130 min
- Drip & Ship
- TOG 190 min

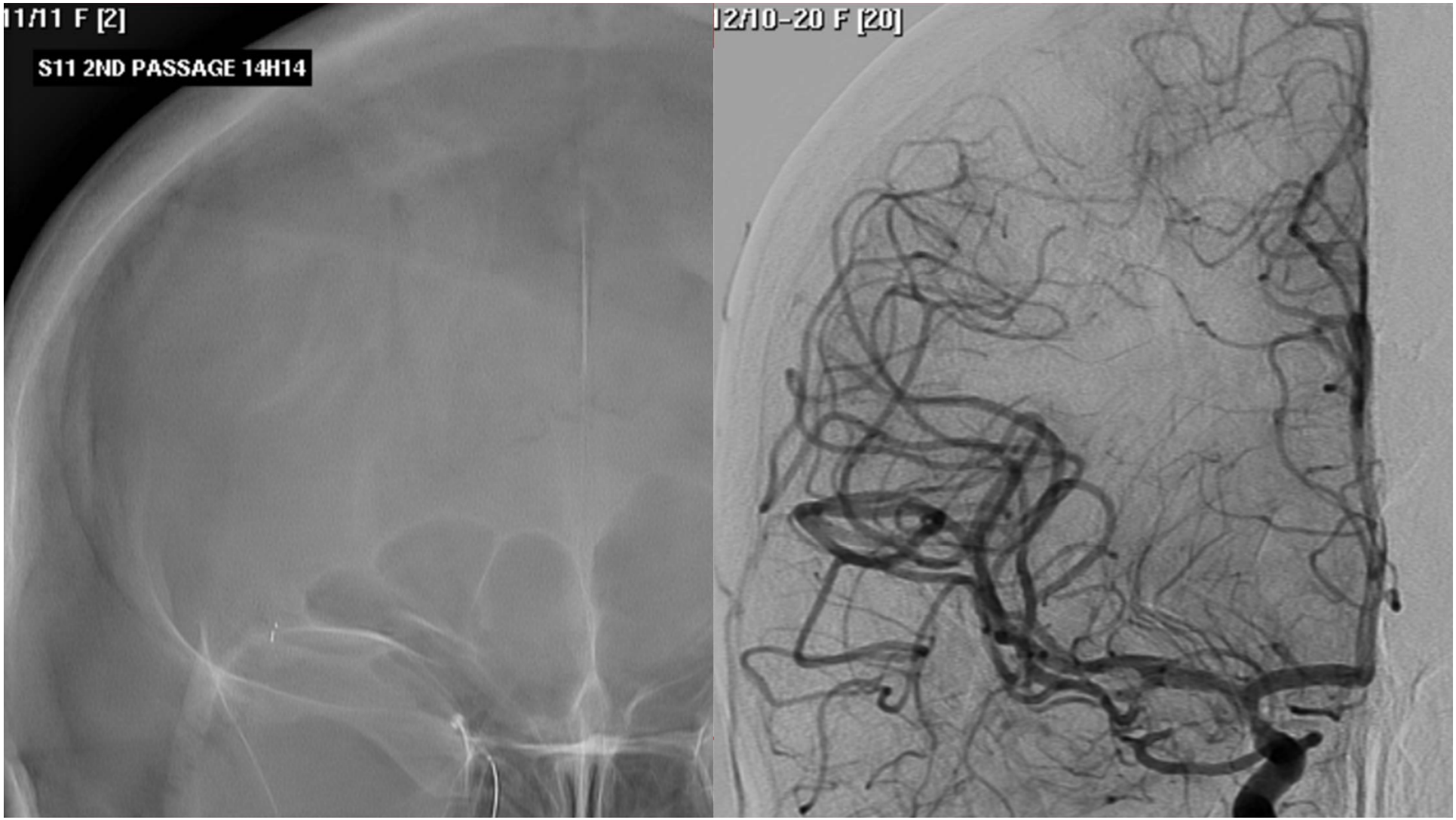
Metrics

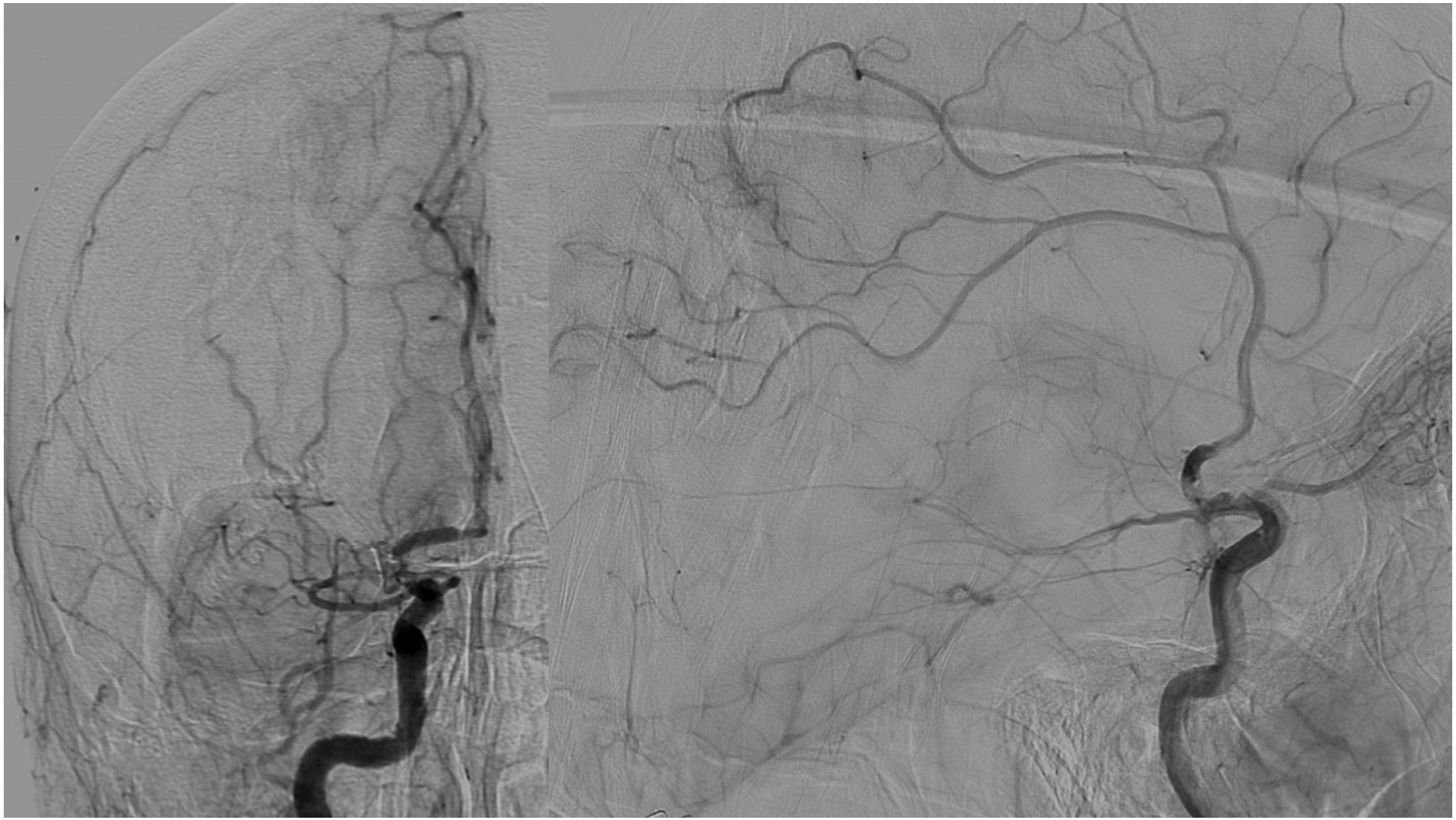



1/11-23 F [23]
1/11-23 L [23]

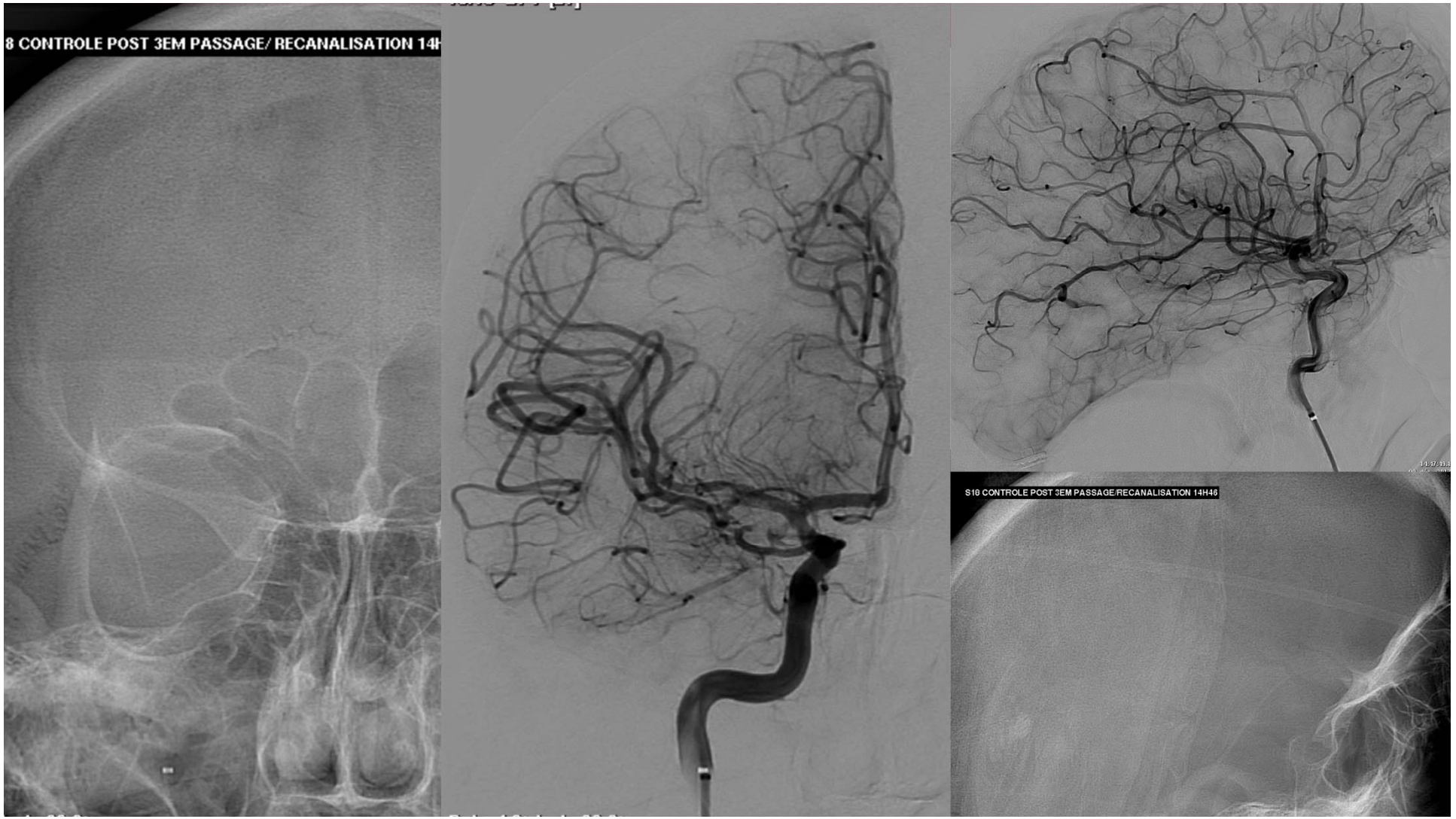

-20 F [20]
PASSAGE SOLITAIRE ET ASPIRATION 13H43

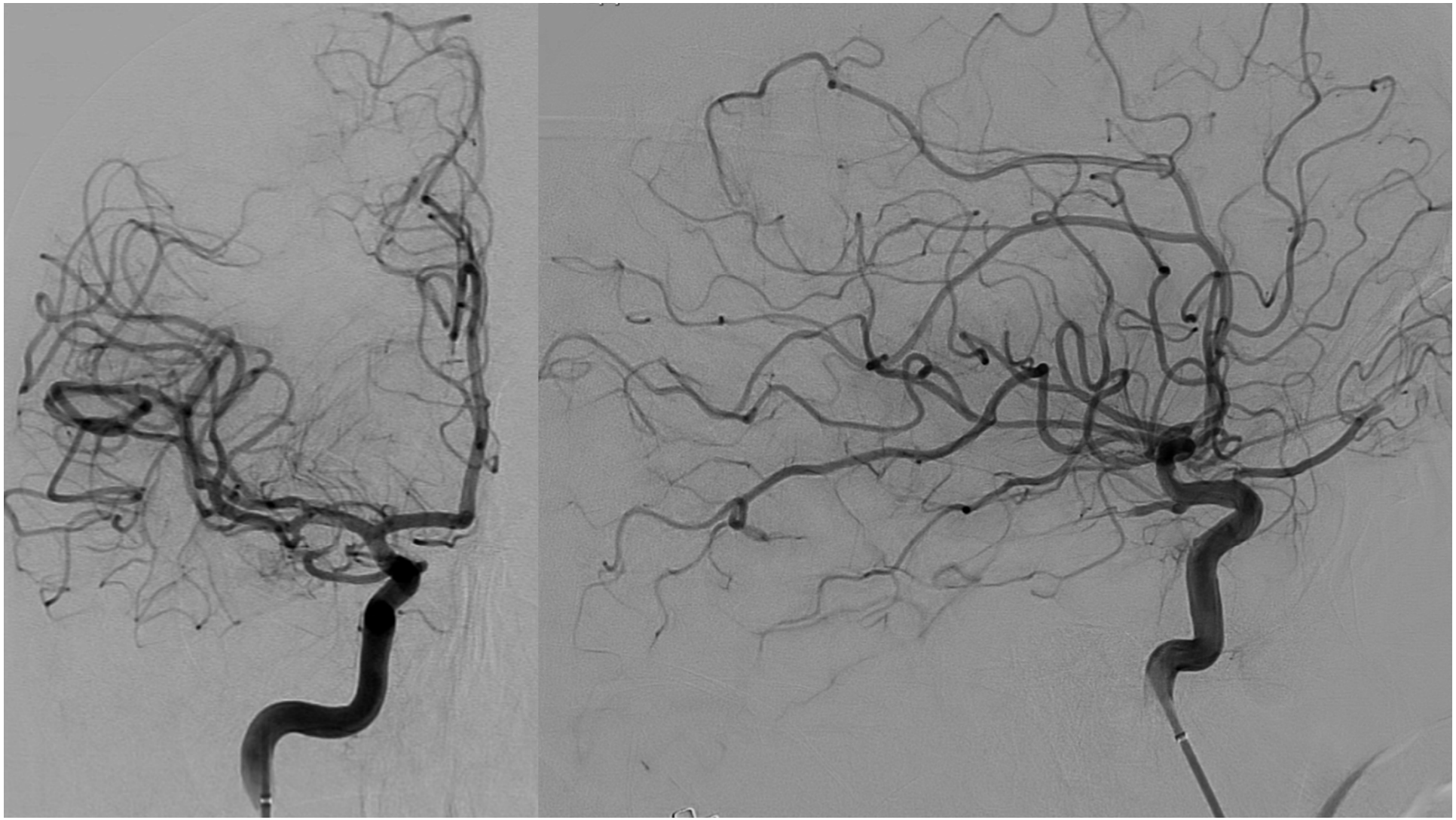


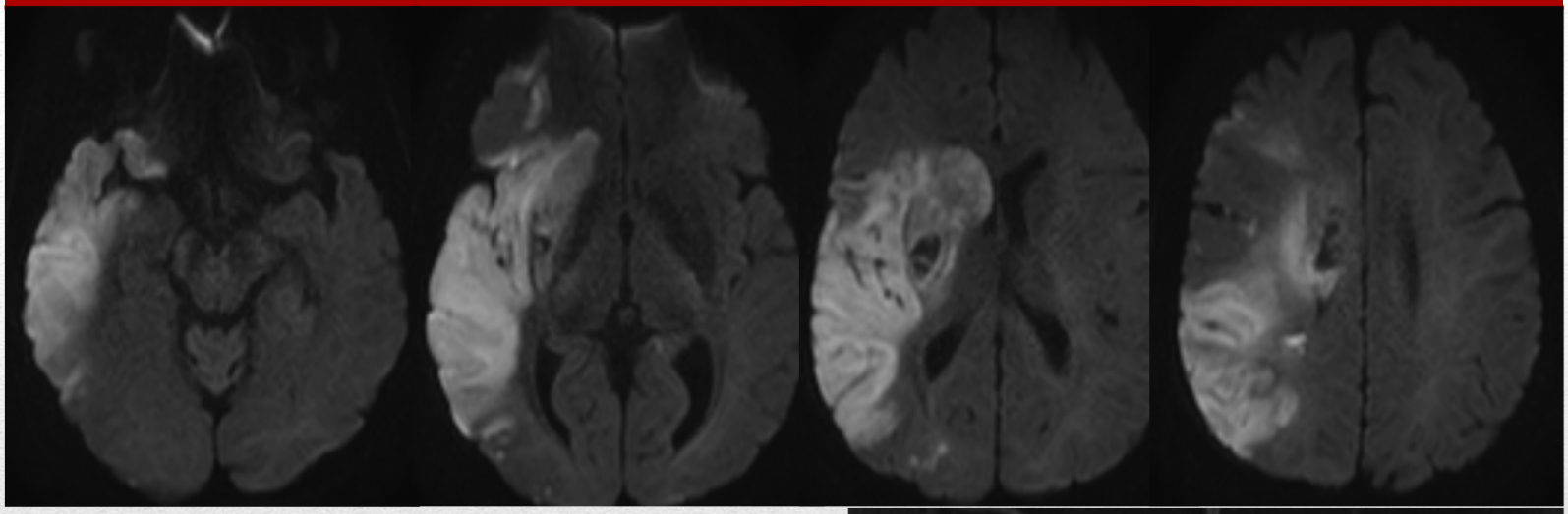

11/11 F [2]
S11 2ND PASSAGE 14H14
12/10-20 F [20]




S16 POST 2MG NIMOTOPE ET BOLUS REOPRO IV

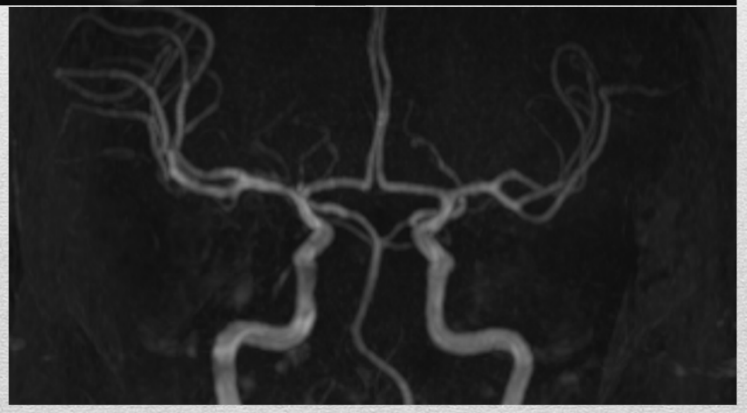

8 CONTROLE POST 3EM PASSAGE/ RECANALISATION 14H
S16 CONTROLE POST 3EM PASSAGE/RECANALISATION 14H46





- Discharged NIHSS 10
- 3 mo mRS 2
- AP Syndrom, Coumadin

F/U



POD 1 MRI

Instant reocclusion following mechanical thrombectomy of in situ thromboocclusion and the role of low-dose intra-arterial tirofiban.

Kang DH[1], Kim YW, Hwang YH, Park SP, Kim YS, Baik SK.

Background: An in situ thromboocclusion (IST) is defined as an infarct extensively involving all or most of a stenosed arterial territory, which is one major stroke mechanism related to intracranial atherosclerosis (ICAS). We focused on ISTs occurring in major cerebral arteries and analyzed their rate of instant reocclusion during mechanical thrombectomy (MT) compared with non-ISTs. Also, we introduced a treatment strategy of low-dose intra-arterial tirofiban administration to prevent such reocclusion following repeat recanalization, and evaluated its safety and efficacy. ***Methods:***We analyzed 168 consecutive patients treated with MT over a 2-year period from May 2011 to April 2013. During MT, if angiography following a successful recanalization showed stenosis at the occlusion site, we performed additional angiographic runs every 10 min for 30 min after the recanalization. Then, if angiography revealed reocclusion, we performed a repeat recanalization, using the same MT technique but additionally followed by low-dose intra-arterial tirofiban infusion. Time-of-flight MR angiography or CT angiography was performed to confirm any underlying ICAS at the occlusion site 5-7 days after the procedure. The patients who had confirmed underlying ICAS were included in the IST cohort. ***Results:*** Of 168 enrolled patients, we excluded 36 who could not be checked for underlying ICAS at the occlusion site for one of the following reasons: recanalization failure (n = 11), rescue stenting after tirofiban failure (n = 5) and lack of follow-up vascular imaging (n = 20). The incidence of IST was 30.3% (40/132). All IST patients were confirmed to have underlying ICAS by follow-up vascular imaging. Instant reocclusion after successful recanalization was significantly more frequent in the IST cohort [26/40 (65%) vs. 3/92 (3.3%); $p < 0.001$]. Regarding the efficacy of low-dose intra-arterial tirofiban infusion, 85.7% of the reocclusion patients finally achieved a thrombolysis in cerebral infarction score 2/3 recanalization, but in the remaining 14.3% of the cases, the condition was refractory to the procedure and required rescue stenting. There were **no cases of symptomatic intracranial hemorrhage** following the procedure. ***Conclusions:*** In situ thromboocclusion was characterized by a significantly higher chance of instant reocclusion during MT. In such cases, low-dose intra-arterial tirofiban administration may be effective and safe. However, future confirmation by prospective multicenter trials seems necessary.

Cerebrovasc Dis 2014;37:350-355

Perseverance

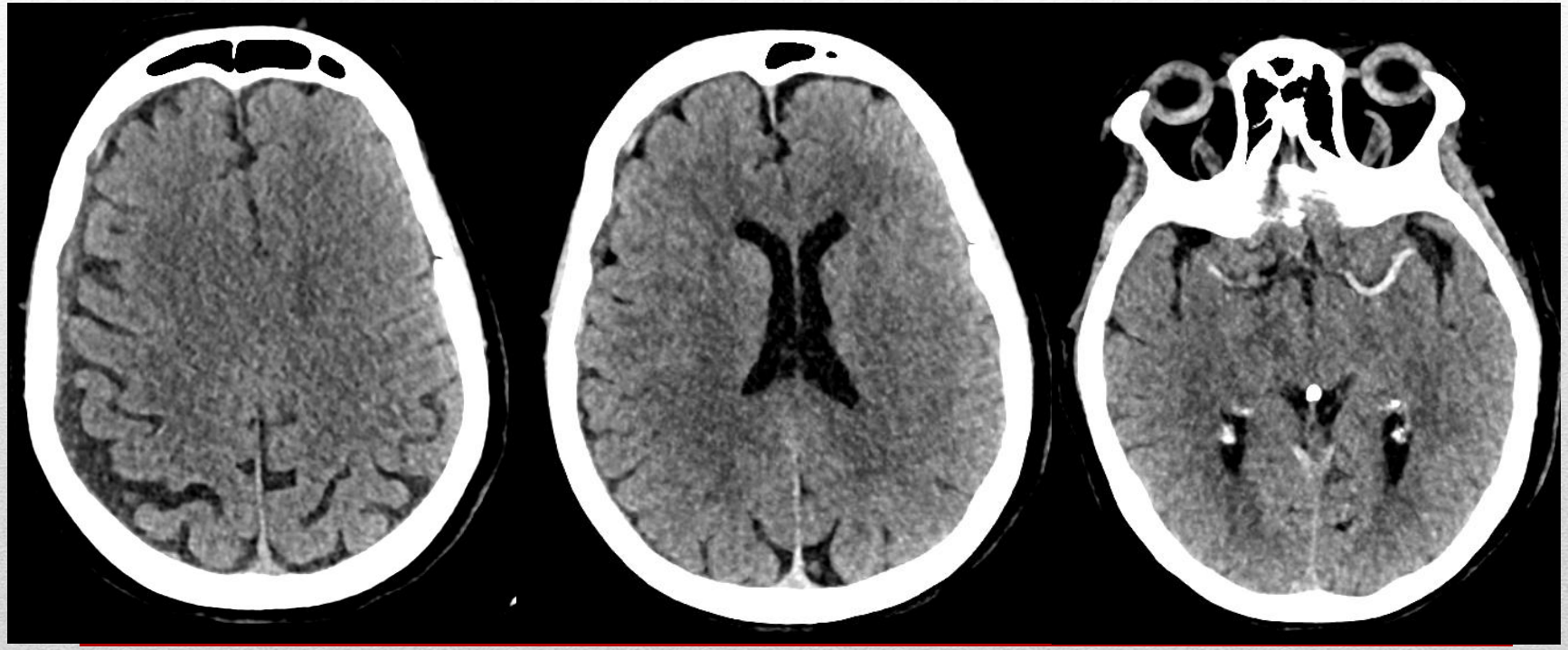
Mirror M1 occlusions

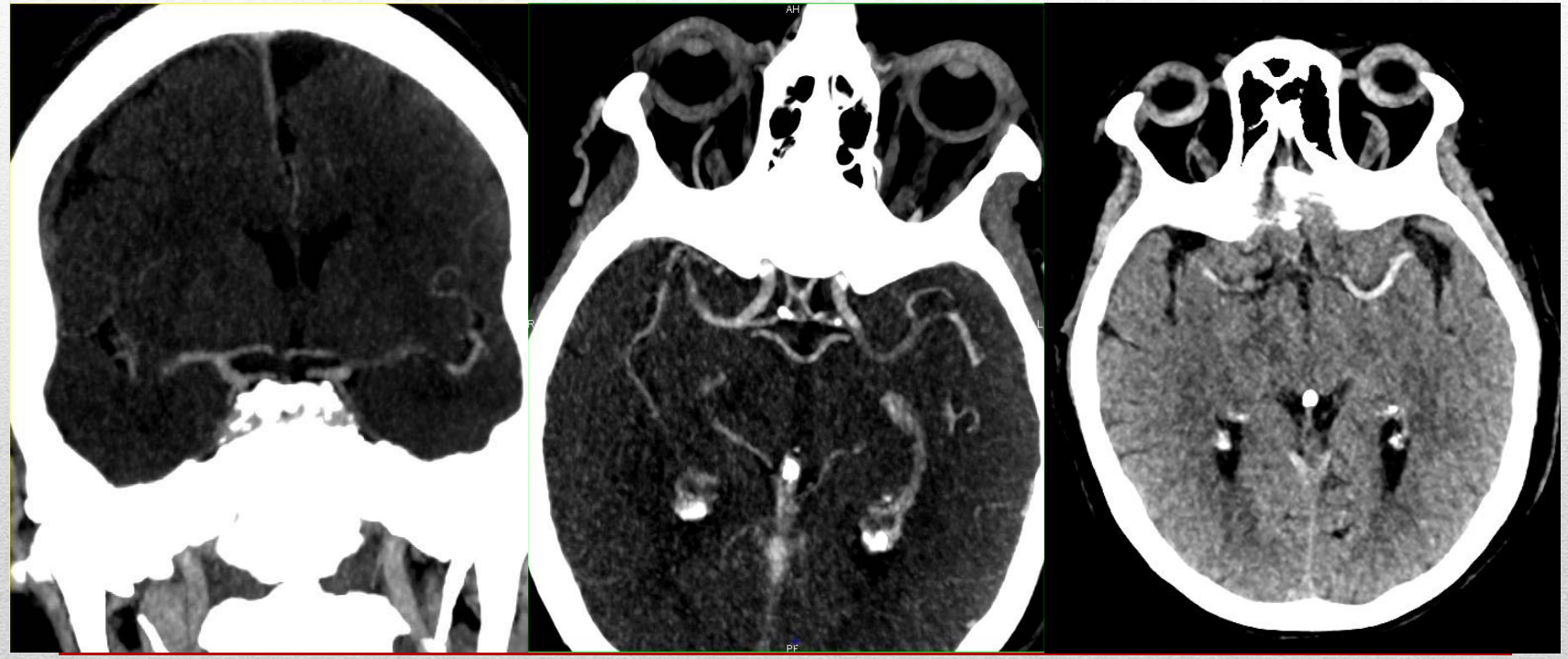
- Most case series of bilateral M1-MCA occlusion report poor prognosis. Only quick reperfusion with Mechanical Thrombectomy (MT) seems to offer a chance for a favorable outcome.

- Here a synchron bilateral M1-MCA occlusion successfully treated with MT.

CASE DESCRIPTION

A 78-year-old female presented with acute comatous (CGS 3). She was intubated and transfered to the closest hospital for a brain CT-scann which found a right 4mm subacute subdural hematoma with no mass effect. Angio-CT demonstrated a bilateral M1-MCA occlusion. She was not thrombolyzed and transferred to the angiosuite for a mechanical thrombectomy.

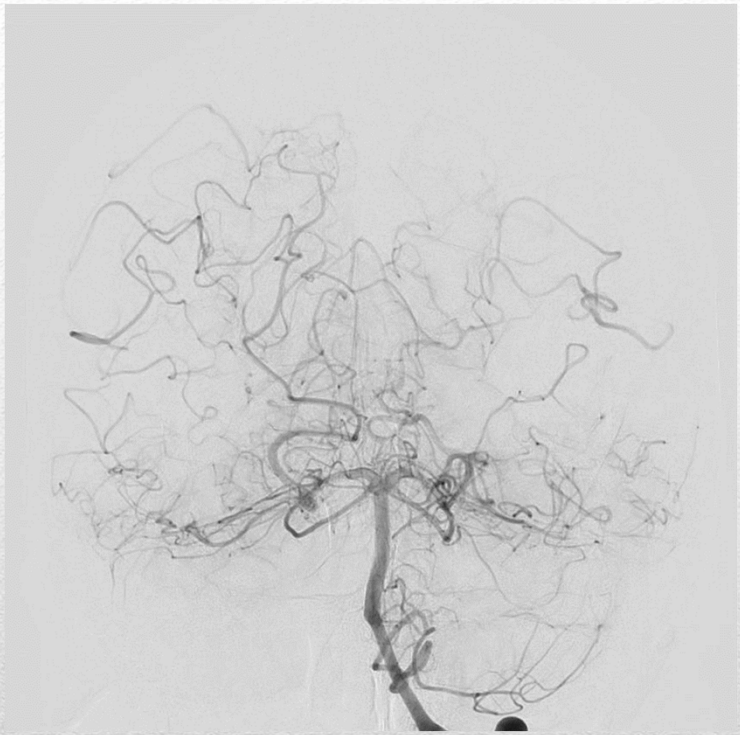


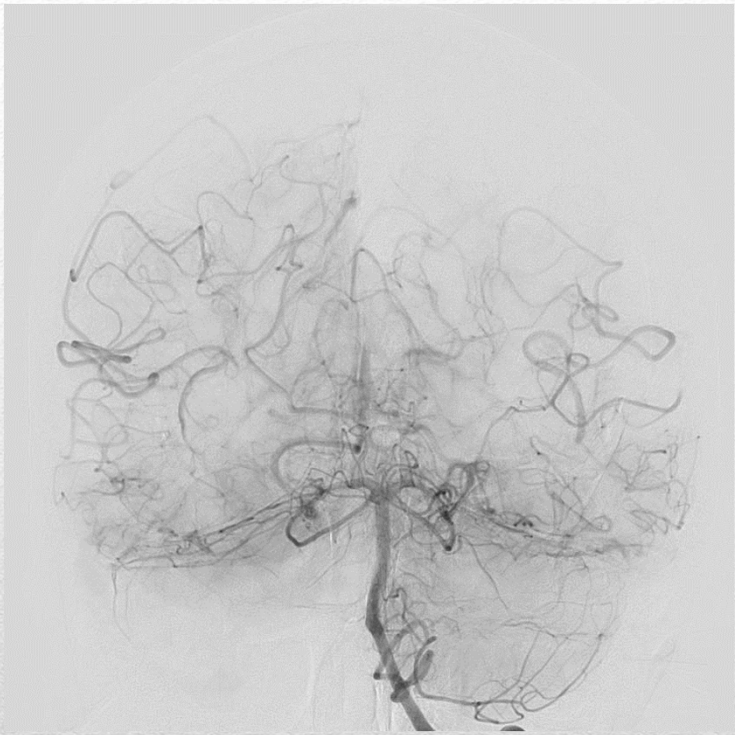


The procedure was performed under general anaethesia, by one senior neuro-interventionist and one experienced fellow assistant.

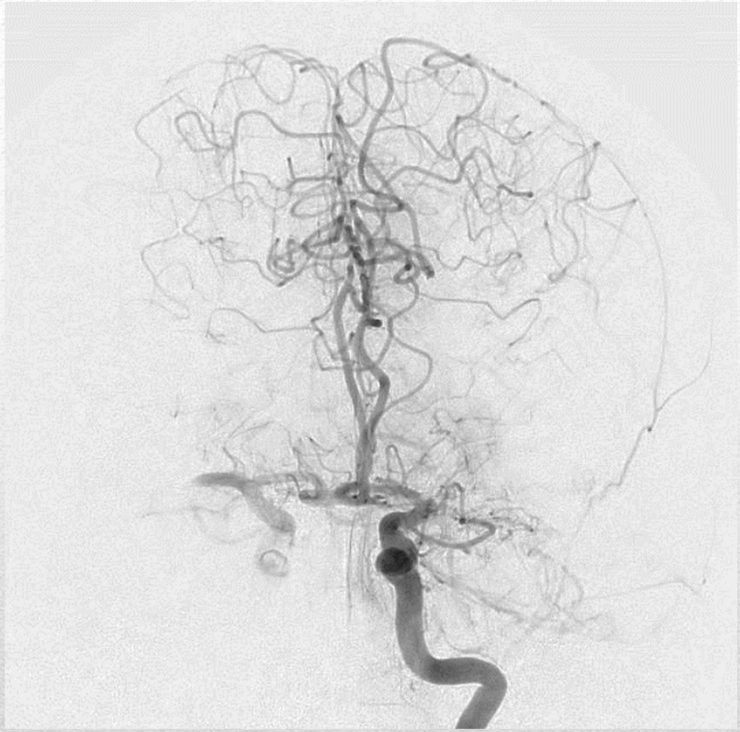
Bilateral 6-Fr femoral puncture was performed and two 6-Fr long Sheath (Neuron Max) were simultaneously introduced.

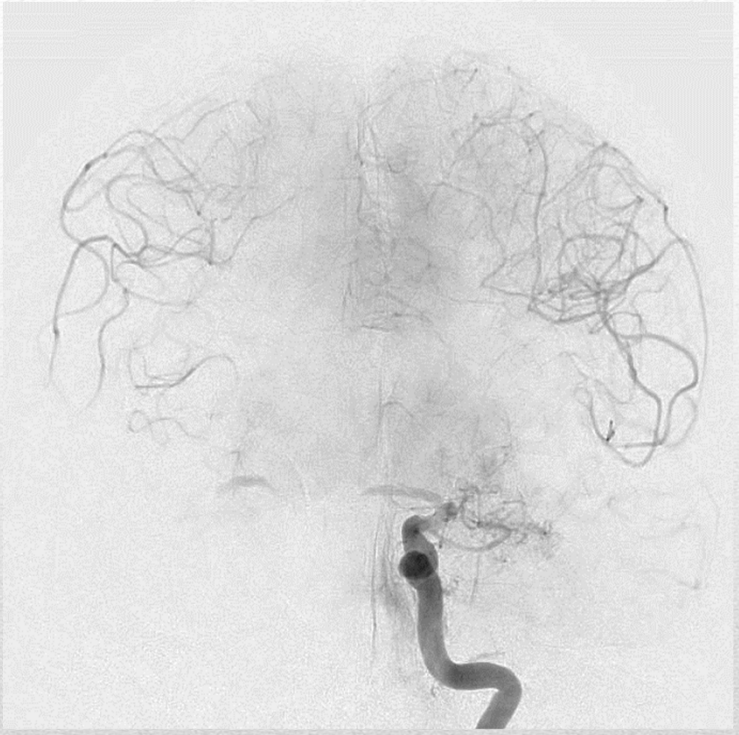
Collateral status was assessed from left vertebral artery and left carotid artery.



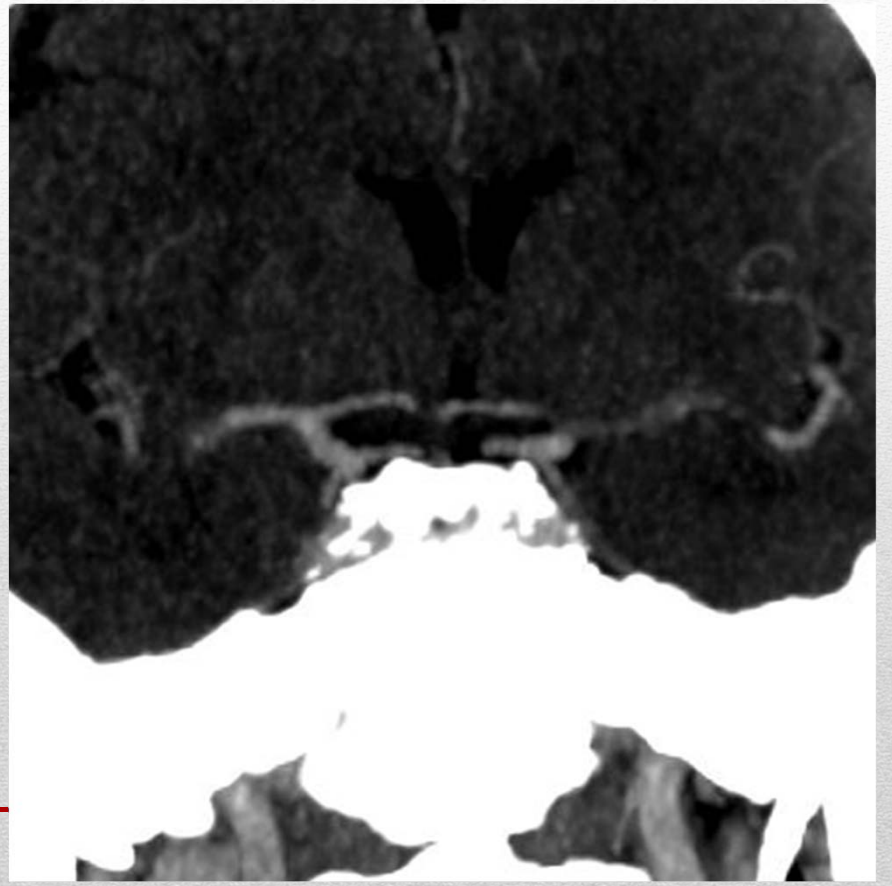


Collateral status from Left Vertebral (Cis 2/3)

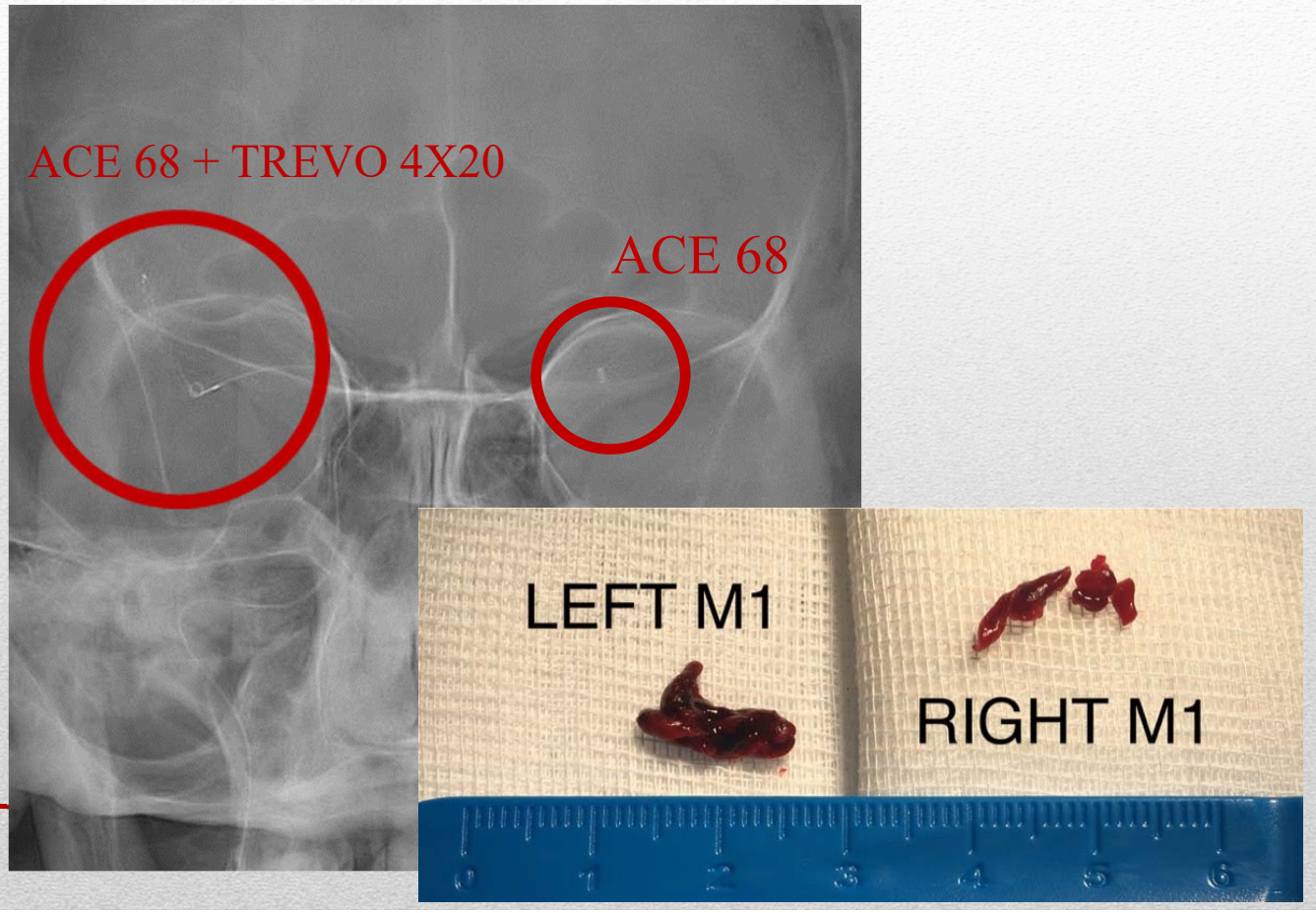




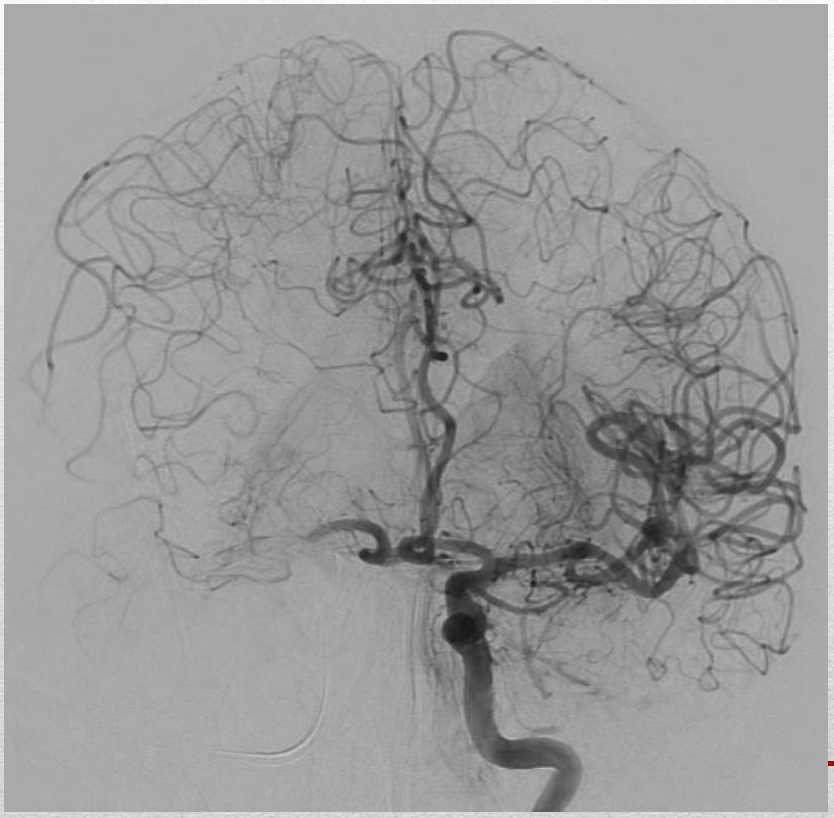
Collateral status from Left Carotid (Cis 2/3)

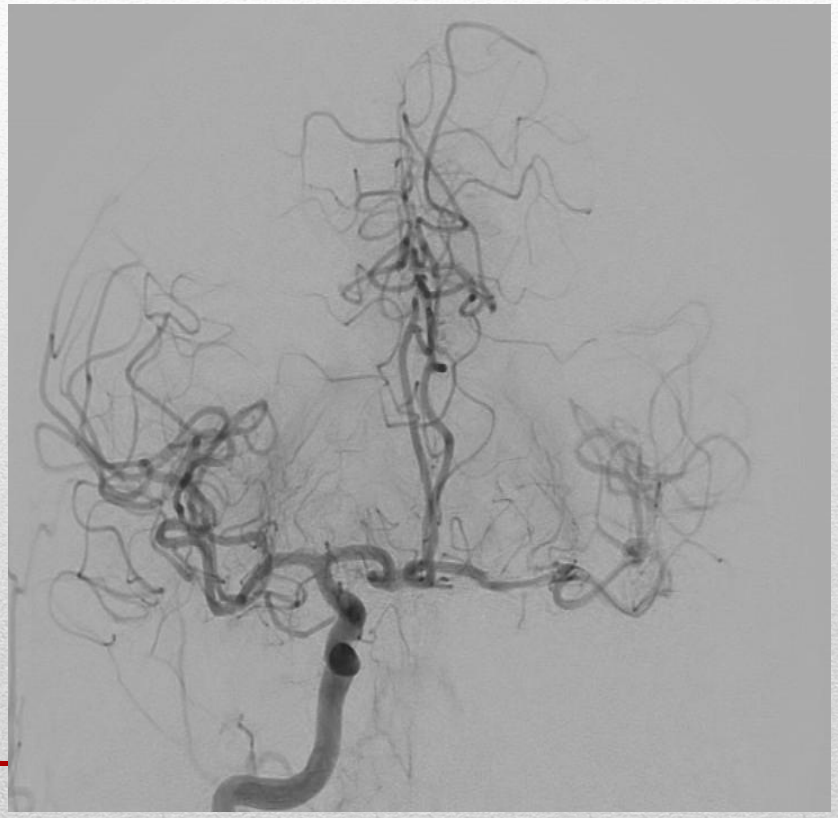


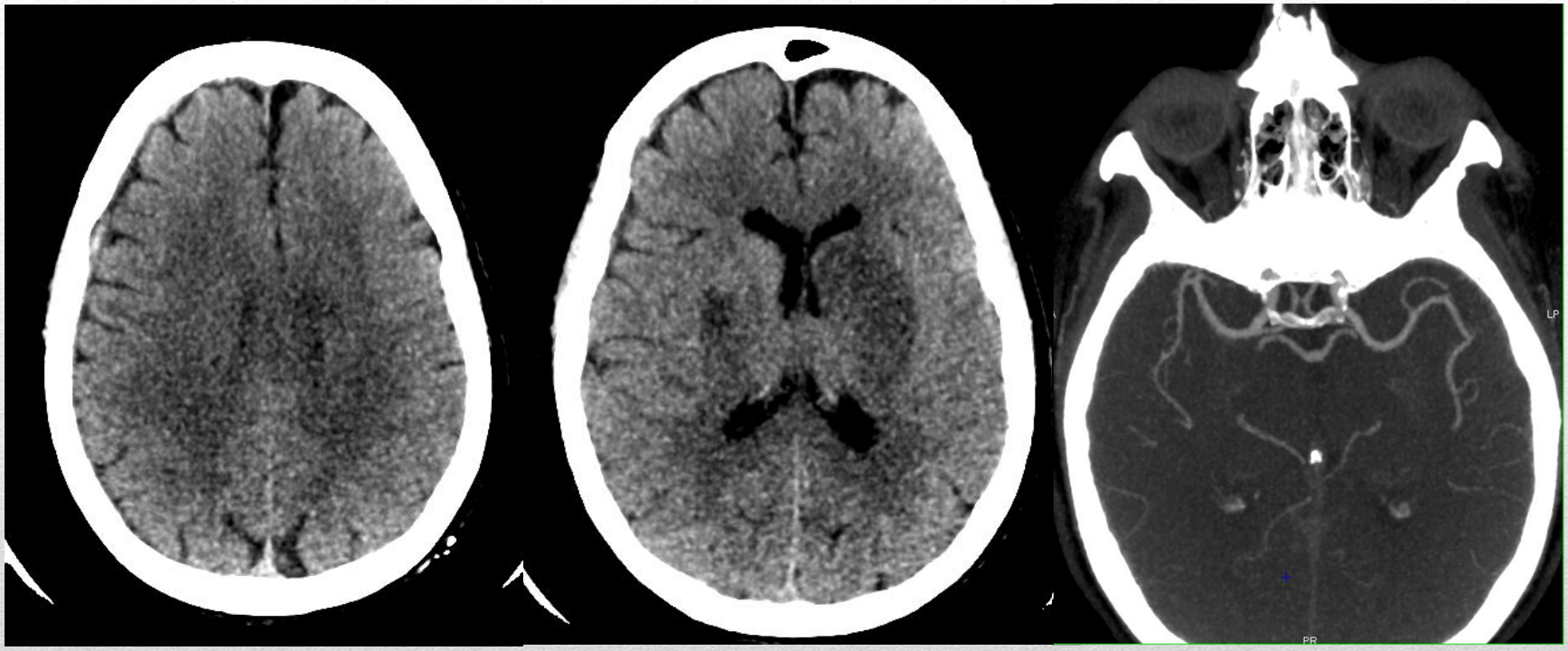
One aspiration catheter (ACE68) was placed in left M1-MCA and aspiration was started (we usually wait 2-3minutes before retrieving the aspiration catheter). During this time, a second aspiration catheter (ACE68) was placed in right M1-MCA with a Trevo 4-20 stentretriever (combined technique). Successful reperfusion was achieved on both sides after one pass (mTICI2C on left side and mTICI3 on the right side).


ACE 68 + TREVO 4X20
ACE 68
LEFT M1
RIGHT M1

The whole procedure length from puncture to recanalization was 27 minutes. Time from onset to recanalization was 247 minutes. The patient was extubated at day-1 and woke up with a mild right brachio-facial deficit (NIHSS 4 at day-2).

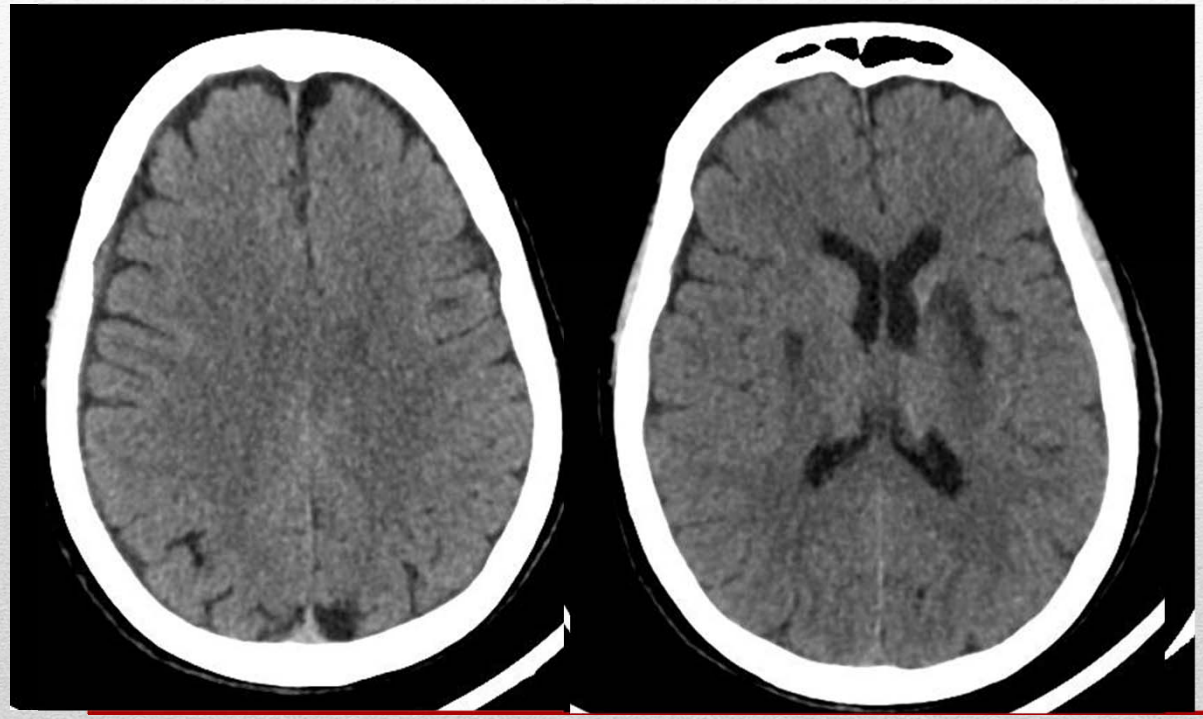






POD 1 CT and angio-CT

3-month Post-op CT



3-month mRS 2 with an improvement of the neurological deficit but a post-ischemic Parkinson syndrom (bilateral putaminal ischemia that responded to L-Dopa.

Thanks!