Qu’est ce que le TICI ?
Quand s’arrêter?

Ecole de la thrombectomie 2020

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TOULOUSE III

Hôpitaux de Toulouse

L’origine: TIMI

Table 1. Thrombolysis in Myocardial Ischemia Scale

TIMI Grades	Definitions
Grade 0	Absence of any antegrade flow beyond the target occlusion (no perfusion)
Grade 1	Any faint antegrade flow beyond the target occlusion, with incomplete filling of the distal branches (penetration without perfusion)
Grade 2	Delayed or sluggish antegrade flow with complete filling of the distal M2 branches flow (partial perfusion)
Grade 3	Normal flow that fills all distal branches, including M3 and M4 (complete perfusion)

TIMI indicates thrombolysis in myocardial ischemia.

Score de reperfusion cerebral: TICI

What Is Meant by "TICI"?

J.E. Fugate, A.M. Klunder, and D.F. Kallmes

AJNR Am J Neuroradiol 34:1792–97 Sep 2013

Grade 2a	Perfusion of <50% of the MCA distribution
	Partial filling of the entire vascular territory
	Partial perfusion with incomplete distal filling of <50% of expected territory
	Partial filling of the entire vascular territory
Grade 2b	Partial perfusion with incomplete distal branch filling of ≥50–99% of the expected territory
	Complete filling, but the filling is slower than normal
	Perfusion of half or greater of the vascular distribution of the occluded artery

On ne parle pas tous de la même chose..

	Perfusion past initial occlusion, but limited distal branch
	Filling
Grade 2	Partial recanalization—recanalization of some but not all of the occluded arteries
	Incomplete recanalization/reperfusion
	Near-normal flow, with flow distal to the occlusion but not filling the distal branches normally
Grade 2a	Perfusion of <50% of the MCA distribution
	Partial filling of the entire vascular territory
	Partial perfusion with incomplete distal filling of <50% of expected territory
	Partial filling of the entire vascular territory
Grade 2b	Partial perfusion with incomplete distal branch filling of ≥50–99% of the expected territory
	Complete filling, but the filling is slower than normal
	Perfusion of half or greater of the vascular distribution of the occluded artery
Grade 2c	Near-complete perfusion without clearly visible thrombus but with delay in contrast run-off
Grade 3	Full perfusion with filling of all distal branches, including M3, M4
	Normal flow
	Partial recanalization with >50% reperfusion
	Full perfusion with normal filling of distal branches in a normal hemodynamic fashion
Grade 4	Complete recanalization/reperfusion

TICI

Trial Design and Reporting Standards for Intra-Arterial Cerebral Thrombolysis for Acute Ischemic Stroke

Randall T. Higashida, MD; Anthony J. Furlan, MD; for the Technology Assessment Committees of the American Society of Interventional and Therapeutic Neuroradiology and the Society of Interventional Radiology

TABLE 2. Thrombolysis in Cerebral Infarction (TICI) Perfusion Categories

Grade 0:	No Perfusion. No antegrade flow beyond the point of occlusion.
Grade 1:	Penetration With Minimal Perfusion. The contrast material passes beyond the area of obstruction but fails to opacify the entire cerebral bed distal to the obstruction for the duration of the angiographic run.
Grade 2:	Partial Perfusion. The contrast material passes beyond the obstruction and opacifies the arterial bed distal to the obstruction. However, the rate of entry of contrast into the vessel distal to the obstruction and/or its rate of clearance from the distal bed are perceptibly slower than its entry into and/or clearance from comparable areas not perfused by the previously occluded vessel, eg, the opposite cerebral artery or the arterial bed proximal to the obstruction.
Grade 2a:	Only partial filling (<⅔) of the entire vascular territory is visualized.
Grade 2b:	Complete filling of all of the expected vascular territory is visualized, but the filling is slower than normal.
Grade 3:	Complete Perfusion. Antegrade flow into the bed distal to the obstruction occurs as promptly as into the obstruction *and* clearance of contrast material from the involved bed is as rapid as from an uninvolved other bed of the same vessel or the opposite cerebral artery.

***Stroke*. 2003;34:e109-e137**

mTICI: modifiedTICI

Comparison of Thrombolysis in Myocardial and Cerebral Infarction (TIMI and TICI) scales

Score	Thrombolysis In Myocardial Infarction (TIMI) scale
0	No recanalization
1	Minimal recanalization
2	Partial recanalization
3	Complete recanalization

*2A is represented by partial filling, less than tw

†2B is represented by complete filling that is slo

Modified Thrombolysis in Cerebral Infarction (TICI) scale

Table 2. Modified Treatment in Cerebral Ischemia Scale

mTICI Grades	Definitions
Grade 0	No perfusion
Grade 1	Antegrade reperfusion past the initial occlusion, but limited distal branch filling with little or slow distal reperfusion
Grade 2a	Antegrade reperfusion of less than half of the occluded target artery previously ischemic territory (eg, in 1 major division of the MCA and its territory)
Grade 2b	Antegrade reperfusion of more than half of the previously occluded target artery ischemic territory (eg, in 2 major divisions of the MCA and their territories)
Grade 3	Complete antegrade reperfusion of the previously occluded target artery ischemic territory, with absence of visualized occlusion in all distal branches

MCA indicates middle cerebral artery; and mTICI, Modified Treatment in Cerebral Ischemia Scale.

rTICI: revisedTICI

2C or not 2C: defining an improved revascularization grading scale and the need for standardization of angiography outcomes in stroke trials

Mayank Goyal[1], **Kyle M Fargen**[2], **Aquilla S Turk**[3], **J Mocco**[4], **David S Liebeskind**[5], **Donald Frei**[6], and **Andrew M Demchuk**[7]

Proposed revised Thrombolysis In Cerebral Infarction scale (TICI) scale including a 2C designation

Score	Revised TICI
0	No perfusion or anterograde flow beyond site of occlusion
1	Penetration but not perfusion. Contrast penetration exists past the initial obstruction but with minimal filling of the normal territory
2	Incomplete perfusion wherein the contrast passes the occlusion and opacifies the distal arterial bed but rate of entry or clearance from the bed is slower or incomplete when compared with non-involved territories
2A	Some perfusion with distal branch filling of <50% of territory visualized
2B	Substantial perfusion with distal branch filling of ≥50% of territory visualized
2C	Near-complete perfusion except for slow flow in a few distal cortical vessels or presence of small distal cortical emboli
3	Complete perfusion with normal filling of all distal branches

J Neurointerv Surg. 2014 March ; 6(2): 83–86. doi:10.1136/neurintsurg-2013-010665.

Quelle classification utiliser ?

Recommendations on Angiographic Revascularization Grading Standards for Acute Ischemic Stroke

A Consensus Statement

Osama O. Zaidat, MD; Albert J. Yoo, MD; Pooja Khatri, MD; Thomas A. Tomsick, MD;

- Définition d'une thrombectomie réussie: mTICI 2B ou mieux
- mTICI est recommandé
- mTICI 2B
  - Reproductible
  - Prédictif d'une bonne évolution clinique

En pratique: r-TICI (ETIS)

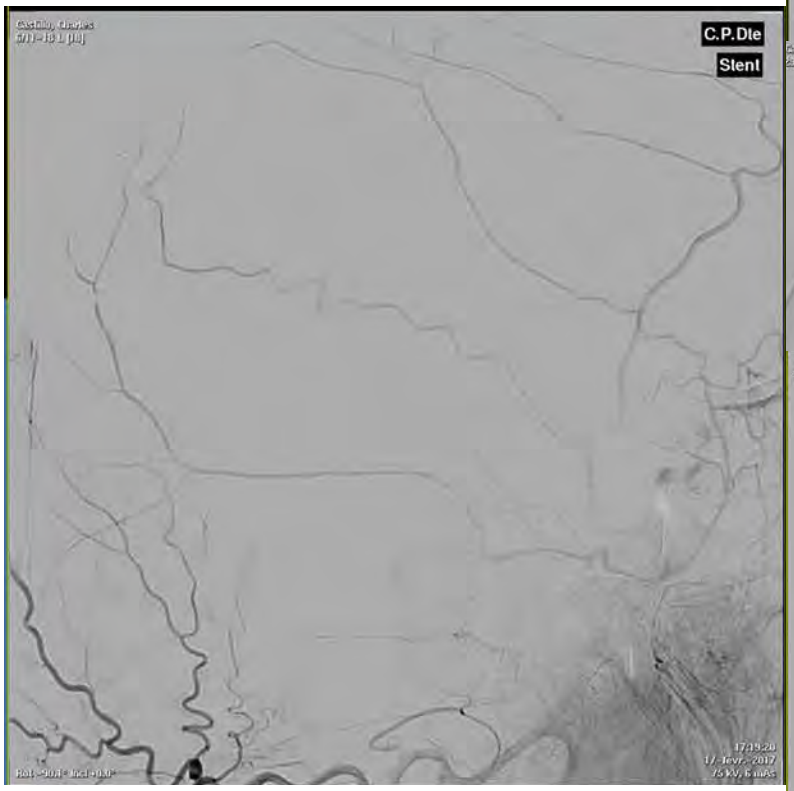

Garcia, Chantal
3/9-16 F [16]
C.I.Dte


C.I.Dte


Garcia, Chantal
21/8-4 F [19]
C.I.Dte
20H10 STENT OUVERT
Rot +20.0° Incl +10.1°

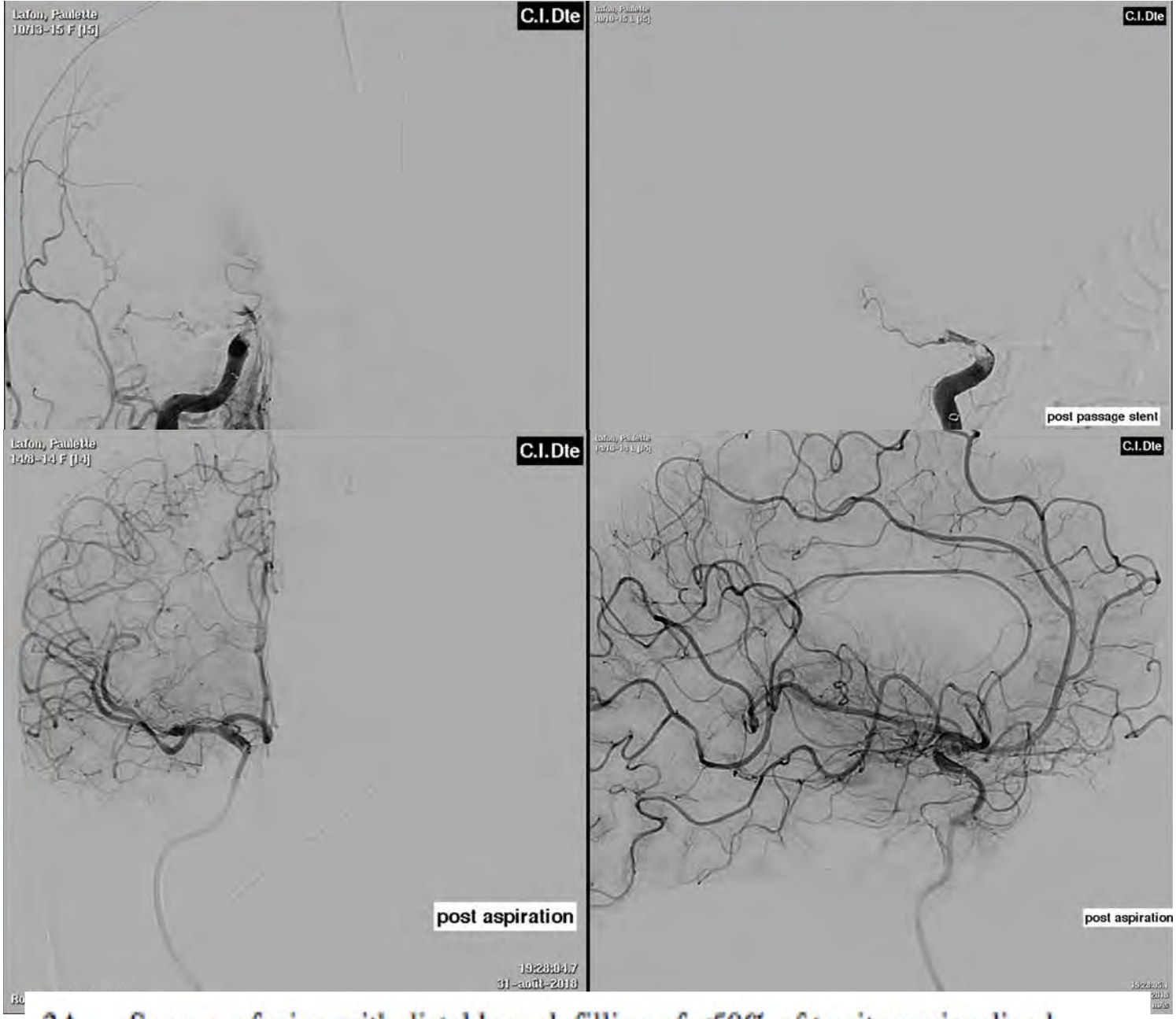

C.I.Dte
20H10 STENT OUVERT
20H12 ASPI


C.I.Dte
C.I.Dte
C.I.Dte
Fin de traitement
3 PASSAGE STENT
1 ASPIRATION SEULE


C.P.Dle
Stent


C.P.Dle


C.P.Gche
Fin de traitement

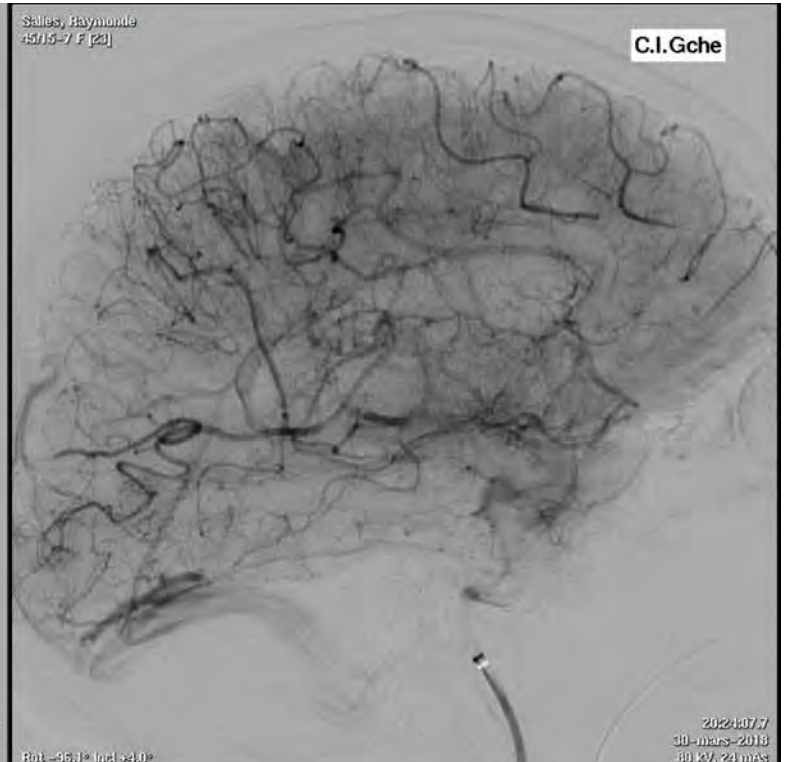


2A Some perfusion with distal branch filling of <50% of territory visualized

2B Substantial perfusion with distal branch filling of ≥50% of territory visualized


Salles, Raymonde
39/12-7 F [22]
C.I.Gche


Salles, Raymonde
44/12-7 F [24]
C.I.Gche
20:22:41.2
30-mars-2018
80 kV, 46 mAs
Rot -2.0° Incl +14.0°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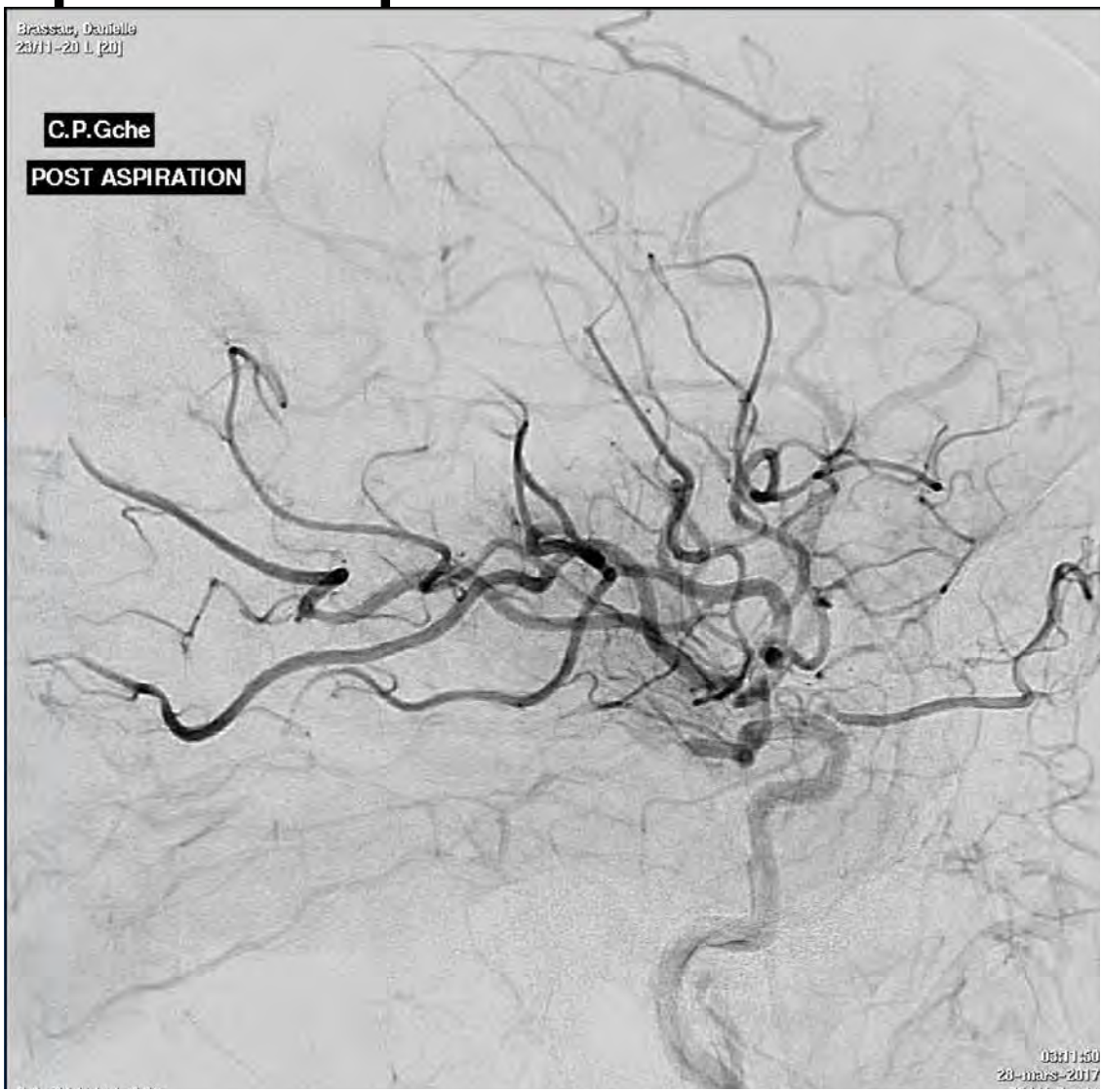
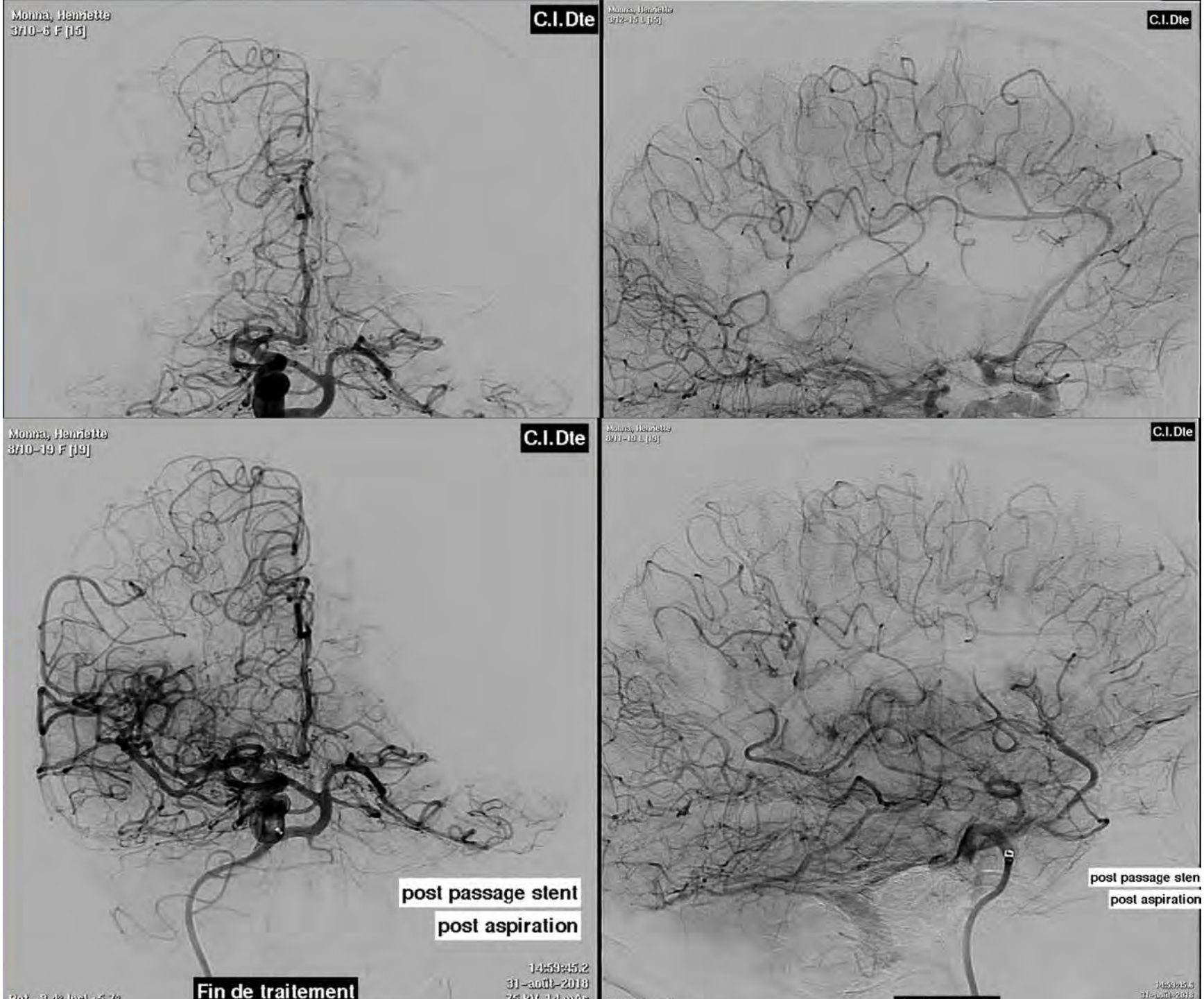
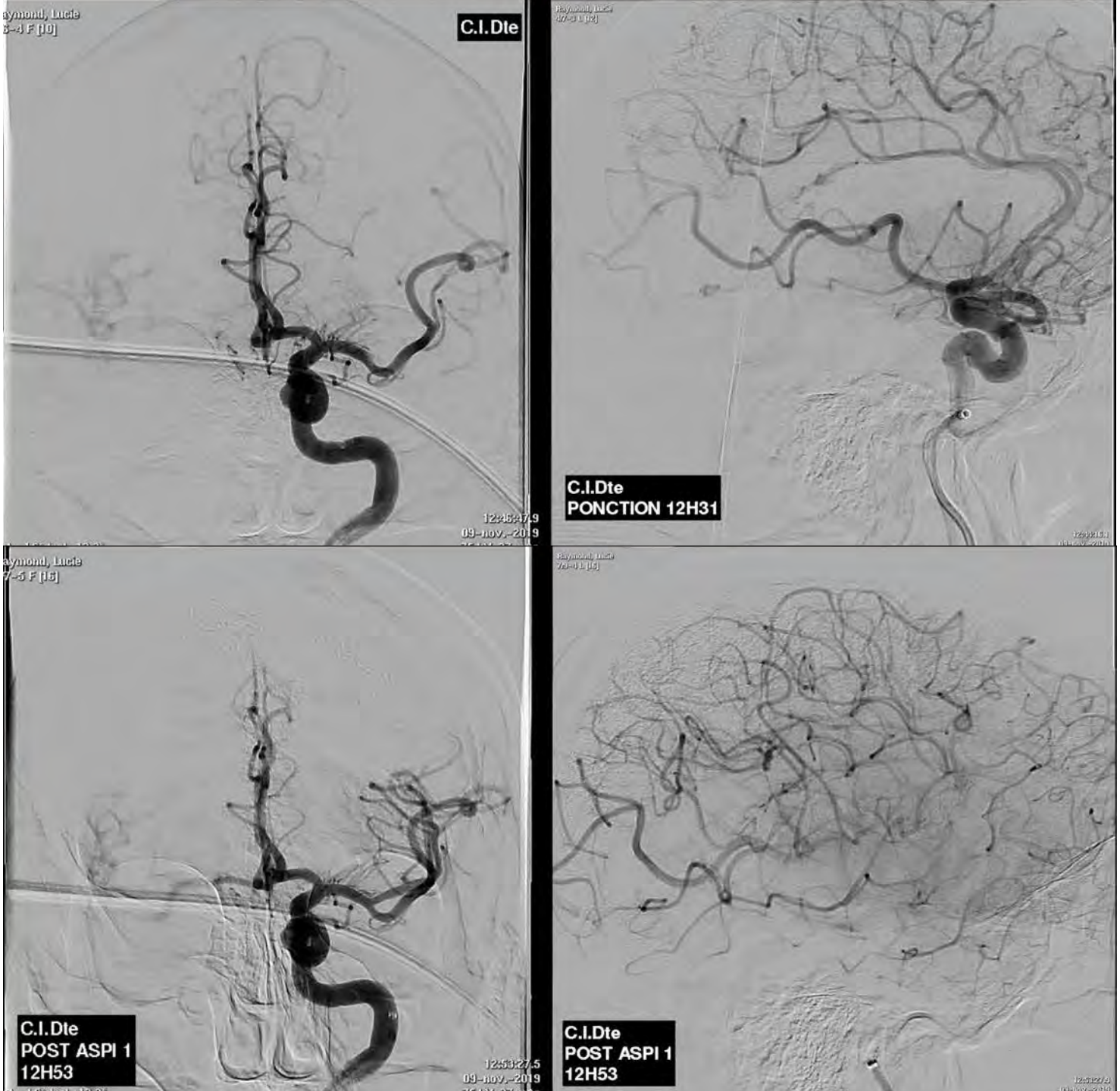
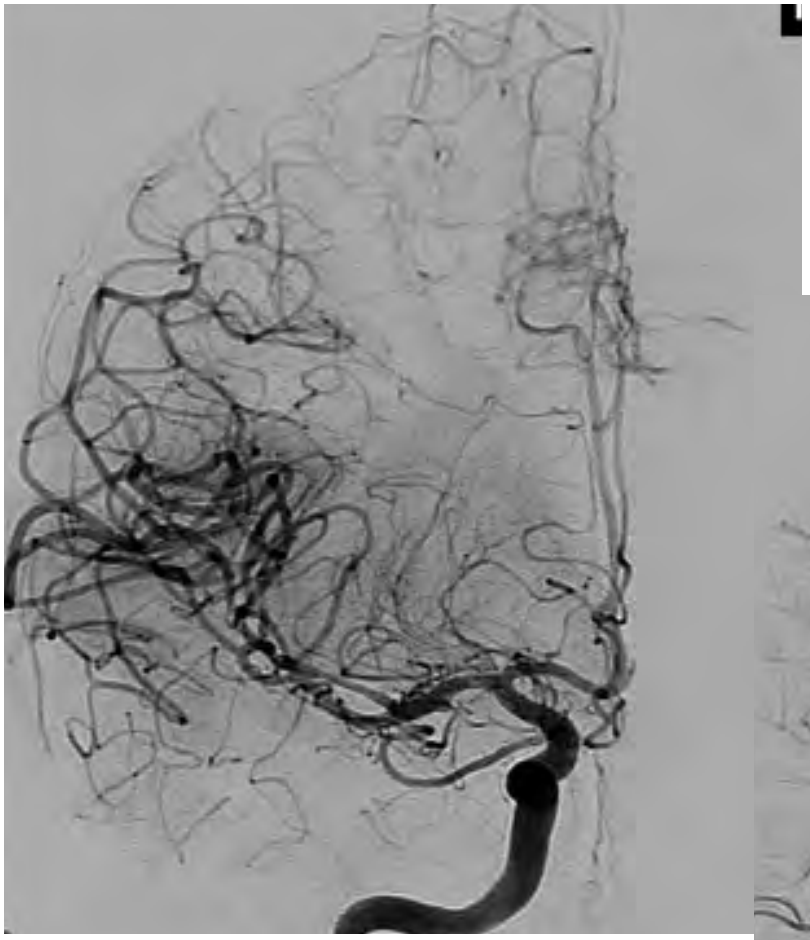
C.I.Gche
20:24:07.7
30-mars-2018

Tandem après aspiration




Monna, Henriette
3/10-6 F [15]
C.I.Dte
Monna, Henriette
8/10-19 F [19]
C.I.Dte
post passage stent
post aspiration
Fin de traitement
14:59:45.2
31-août-2018
C.I.Dte
post passage sten
post aspiration


C.I.Dte
09-nov.-2019
C.I.Dte
PONCTION 12H31
C.I.Dte
POST ASPI 1
12H53
09-nov.-2019
C.I.Dte
POST ASPI 1
12H53



TICI 2B – 2C

2B Substantial perfusion with distal branch filling of ≥50% of territory visualized

2C Near-complete perfusion except for slow flow in a few distal cortical vessels or presence of small distal cortical emboli

TICI 3

QUAND S’ARRETER?

TICI 2A ?

TICI 2B ?

TICI 3 ?

REPERFUSION ET EFFICACITE CLINIQUE
OBJECTIF : TICI 3

Impact of Modified TICI 3 versus Modified TICI 2b Reperfusion Score to Predict Good Outcome following Endovascular Therapy

C. Dargazanli, A. Consoli, M. Barral, J. Labreuche, H. Redjem, G. Ciccio, S. Smajda, J.P. Desilles, G. Taylor, C. Preda, O. Coskun, G. Rodesch, M. Piotin, R. Blanc, and B. Lapergue

222 patients

	TICI 2B	TICI 3
mRS 0-2	50.5 %	71.7 %

AJNR Am J Neuroradiol 38:90–96 Jan 2017

REPERFUSION ET EFFICACITE CLINIQUE: OBJECTIF TICI 2c/ 3

Stroke. 2018 May;49(5):1189-1196. doi: 10.1161/STROKEAHA.118.020700. Epub 2018 Apr 6.

Modified Thrombolysis in Cerebral Infarction 2C/Thrombolysis in Cerebral Infarction 3 Reperfusion Should Be the Aim of Mechanical Thrombectomy: Insights From the ASTER Trial (Contact Aspiration Versus Stent Retriever for Successful Revascularization).

Dargazanli C[1], Fahed R[2], Blanc R[2], Gory B[3], Labreuche J[4], Duhamel A[4], Marnat G[5], Saleme S[6], Costalat V[7], Bracard S[3], Desal H[8], Mazighi M[2], Consoli A[9], Piotin M[2], Lapergue B[9]; ASTER Trial Investigators.

Table 2. Clinical Outcomes According to Successful Reperfusion Grades After Mechanical Thrombectomy

	mTICI Grades			*P* Value*†	OR for mTICI 2C/3 vs 2B; *P* Value
	2B (n=89)	2C (n=62)	3 (n=139)		
Favorable outcome‡					
n (%)	36/84 (42.9)	34/60 (56.7)	76/134 (56.7)		
Center-adjusted OR (95% CI)	1.00 (ref.)	1.71 (0.98–3.00)	1.73 (0.88–3.41)	0.13/0.072	1.72 (1.01–2.90); 0.043

QUAND S'ARRETER?

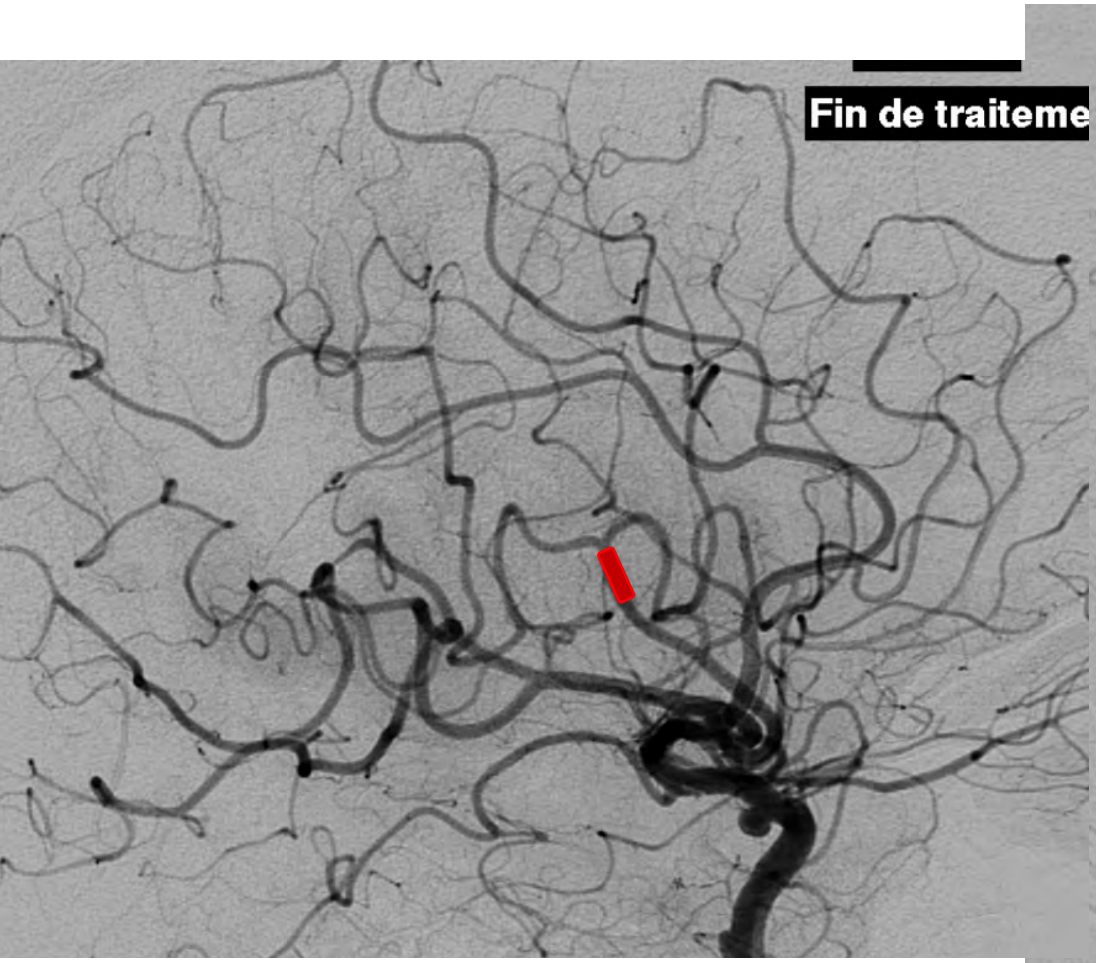
TICI 2A ?

TICI 2B ?

TICI 2c ?

TICI 3 ?

Thrombectomie distale
Quel matériel?



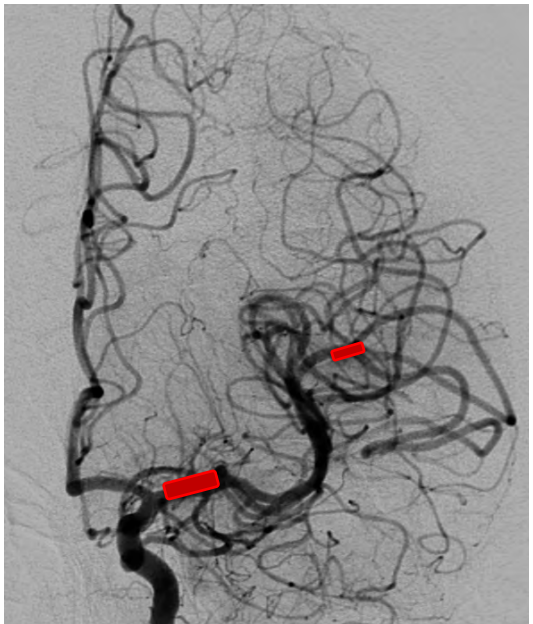
M1 vs M3

M1

- Droite
- 4mm
- Enorme bénéfice

M3

- Curviligne
- 2mm
- Futile?



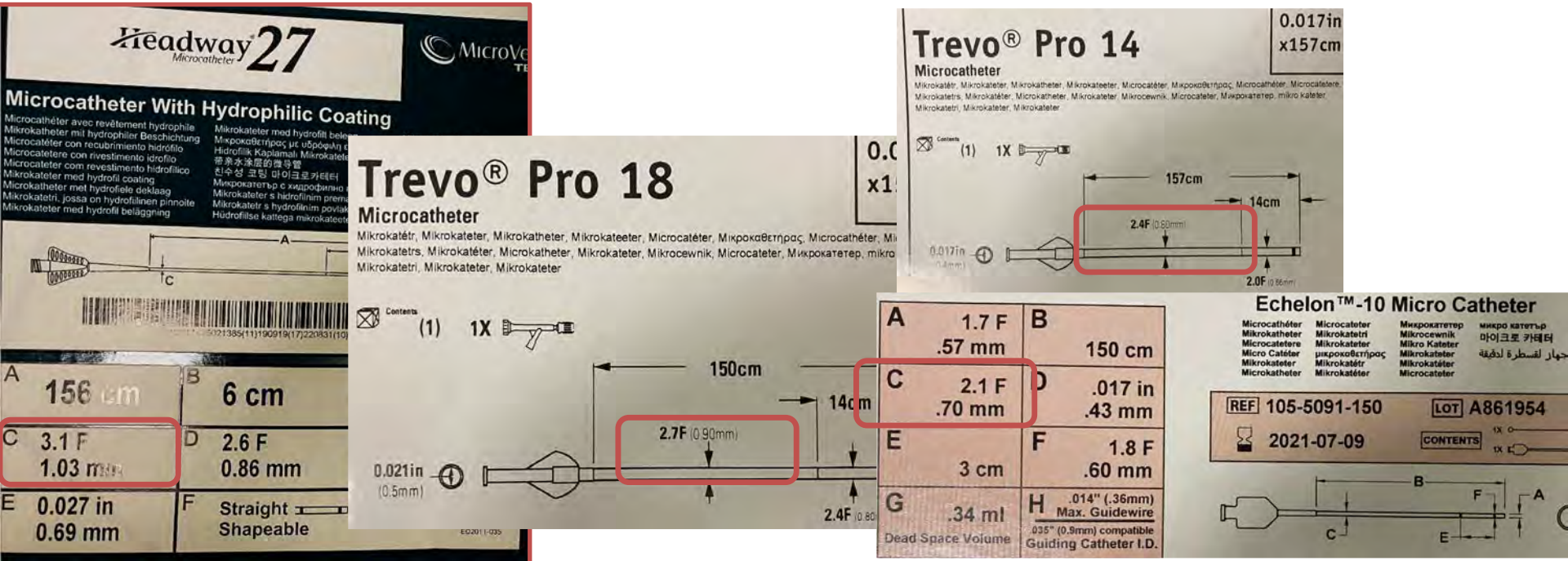
Quel matériel ?

M1

- Cathe 27
- Aspi 6 F
- Stent 6 -5

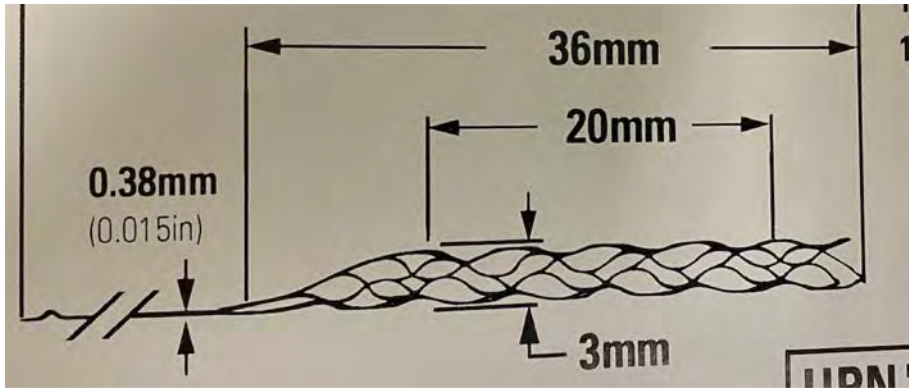
M3

- Cathe + Fin
- Aspi plus petite
- Stent plus… petit



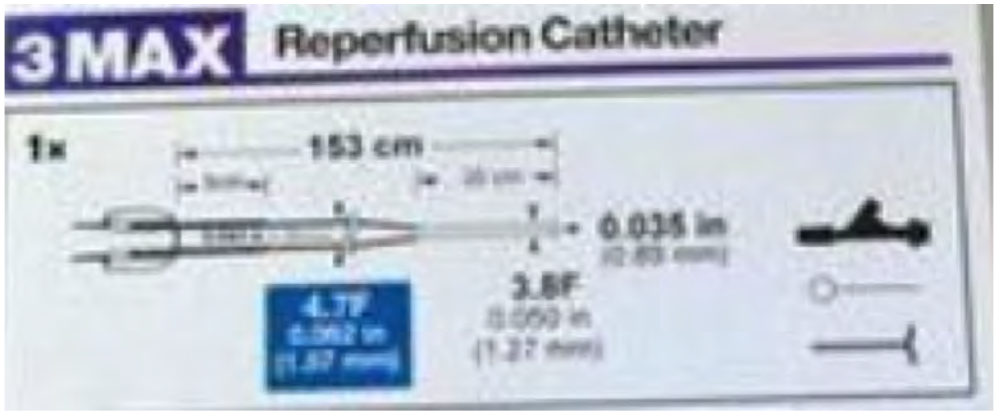
Thrombec « distale » mode d'emploi:

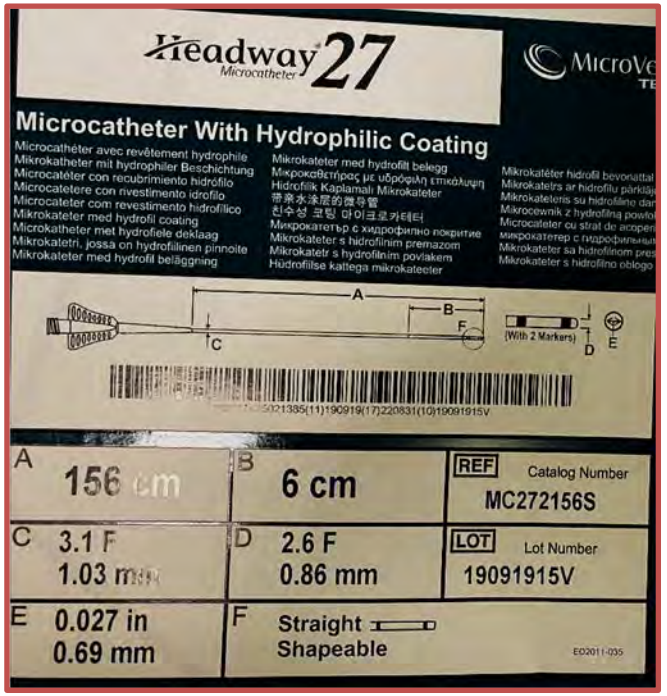
- Cathe lumière de 0.017 ''
  - Echelon 10 0.7mm
  - Trevo Pro 14 0.8mm
  - Headway 17 0.8mm
- Stents pour du 0.17''
  - Catch Mini 3.5 / 3
  - Trevo 3
- Guide : 0.14''
  - J shape



Aspi distale ?

- 3 max 0.35: in mais 1.27 mm
- Headway 27: 0.27 in 1.03 mm





QUAND S'ARRETER?

TICI 2b ou chercher le TICI 3?

A QUEL PRIX?

PERFORATION

ORIGINAL RESEARCH

Vessel perforation during stent retriever thrombectomy for acute ischemic stroke: technical details and clinical outcomes

Maxim Mokin,[1] Kyle M Fargen,[2] Christopher T Primiani,[1] Zeguang Ren,[1] Travis M Dumont,[3] Leonardo B C Brasiliense,[3] Guilherme Dabus,[4] Italo Linfante,[4] Peter Kan,[5] Visish M Srinivasan,[5] Mandy J Binning,[6] Rishi Gupta,[7] Aquilla S Turk,[8] Lucas Elijovich,[9] Adam Arthur,[9] Hussain Shallwani,[10] Elad I Levy,[10] Adnan H Siddiqui[10]

Mokin M, et al. J NeuroIntervent Surg 2017;9:922–928

- 1599 THROMBECTOMIES
- 1% de perforation: 16 cas
- 63% distales (10/16) :M2/M3 ++
- 56% de mortalité durant l'hospitalisation

PERFORATIONS

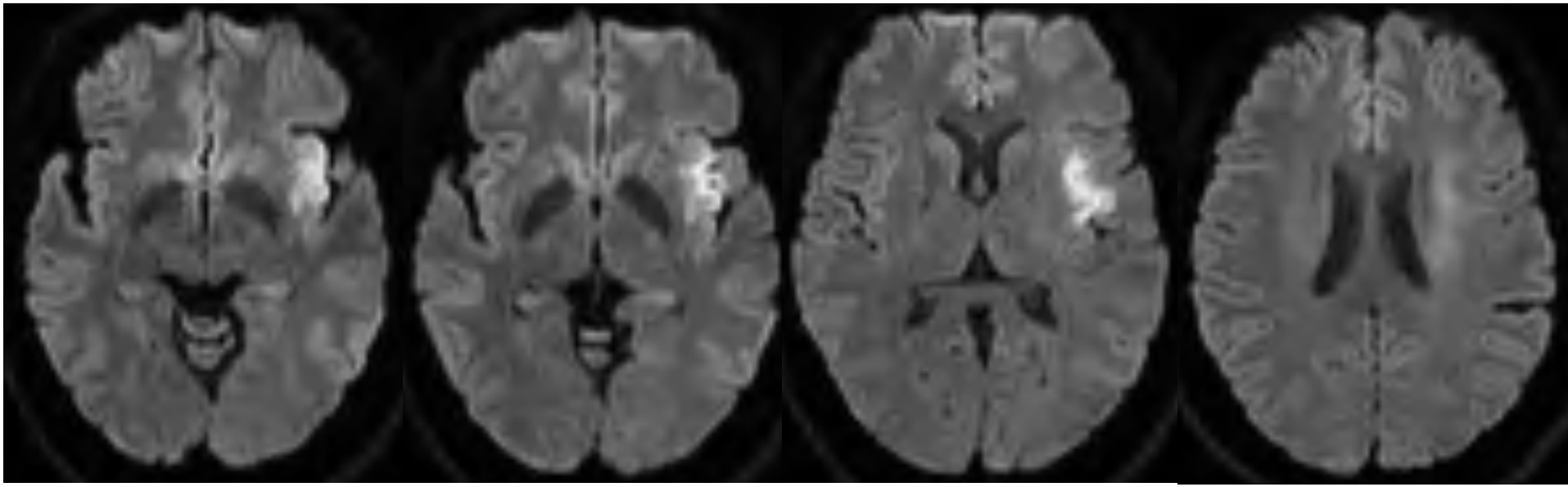
- Causes potentielles:
- Caillot “dur” : échec d’aspiration
- Difficulté pour traverser le caillot: perforation sur microguide
- Stentretriver “traumatique “: trop large
- Déformation de l’anatomie au retrait (M3)

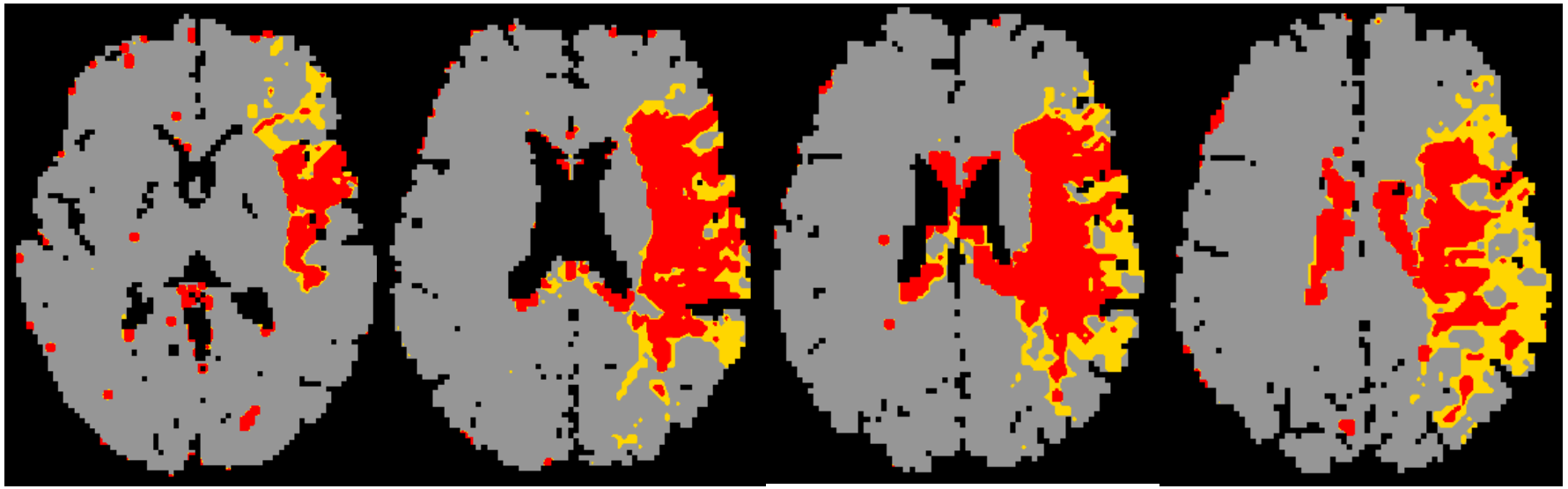
46 ans

Depuis 20h30 aphasie/ hémiparésie fluctuante

IV: 23h

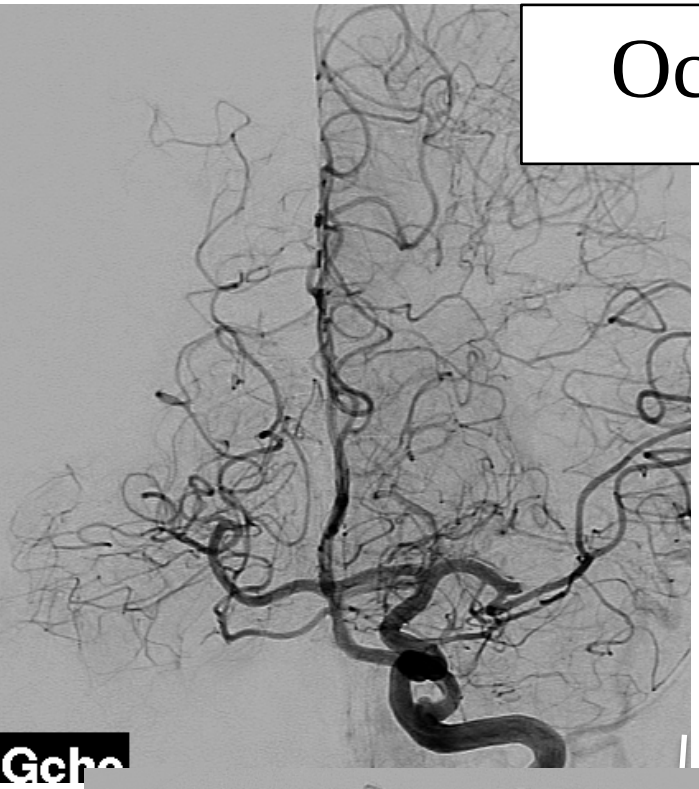
2.45 am, aggravation NIHSS:8

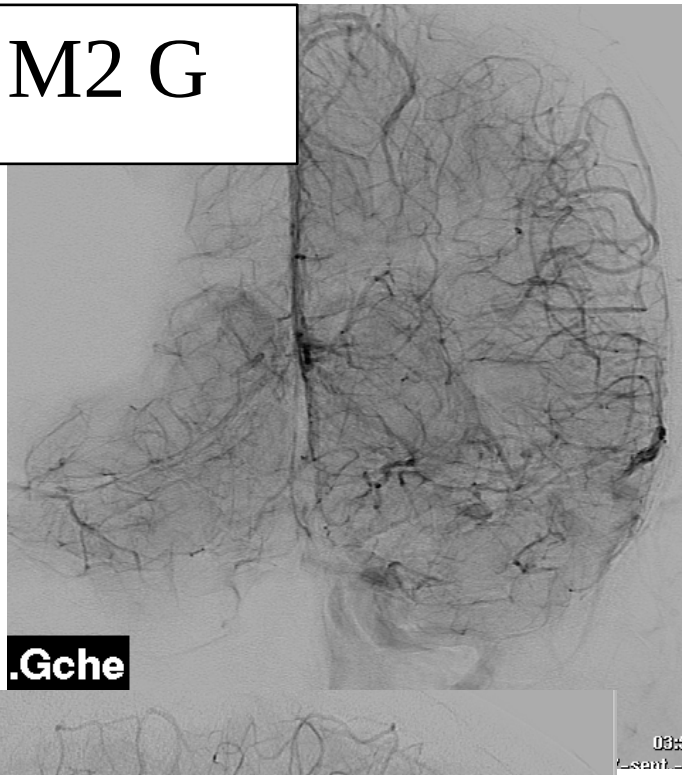


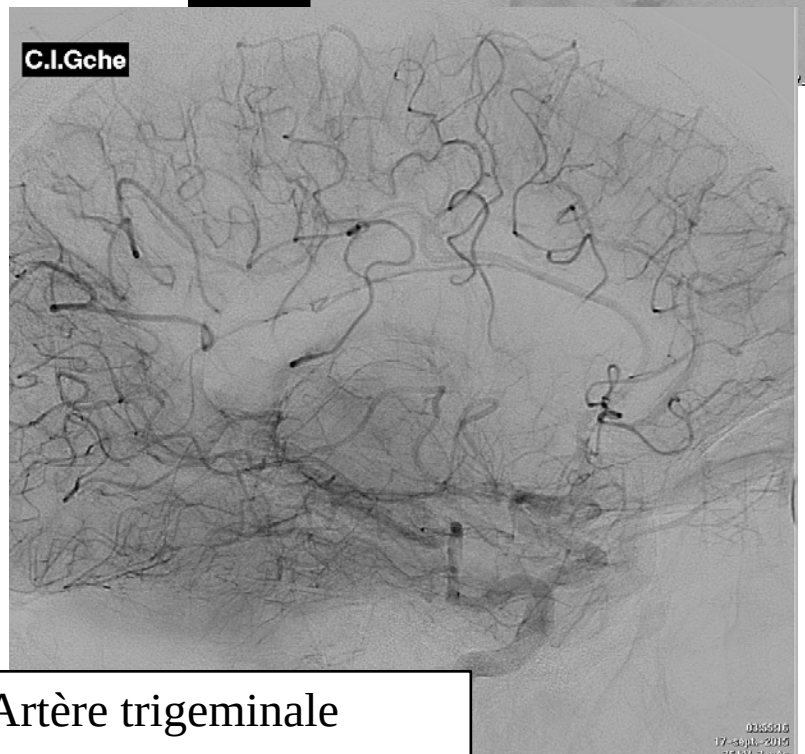


Tmax

Occlusion de M2 G

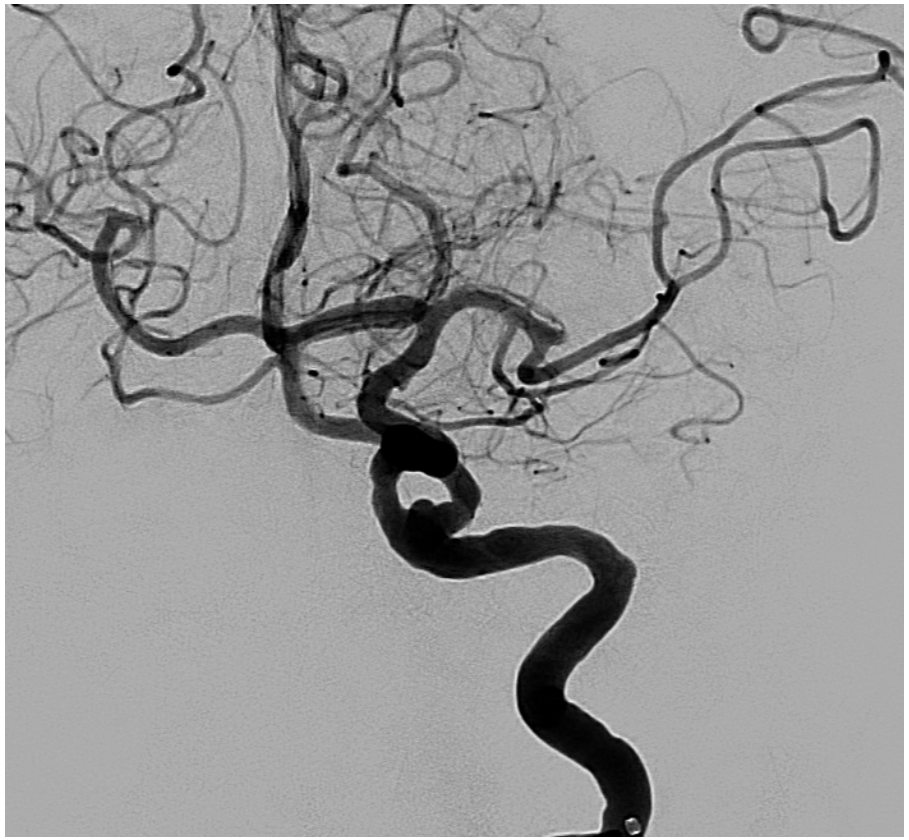




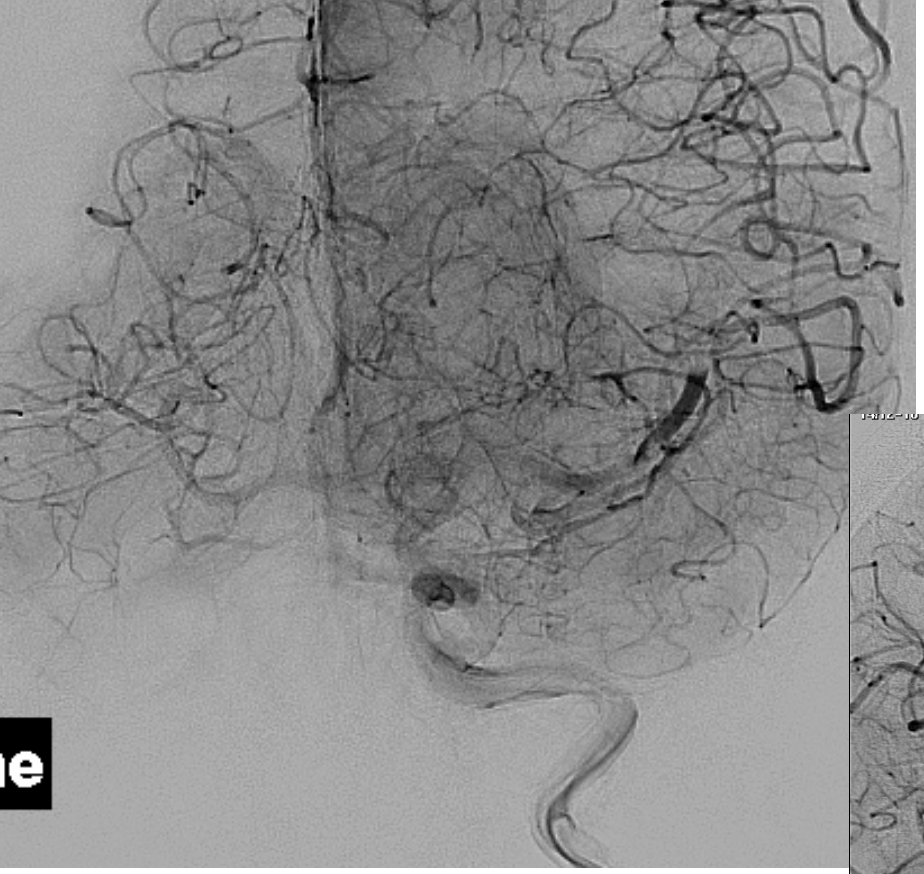


Artère trigeminale


Gche



Après un passage



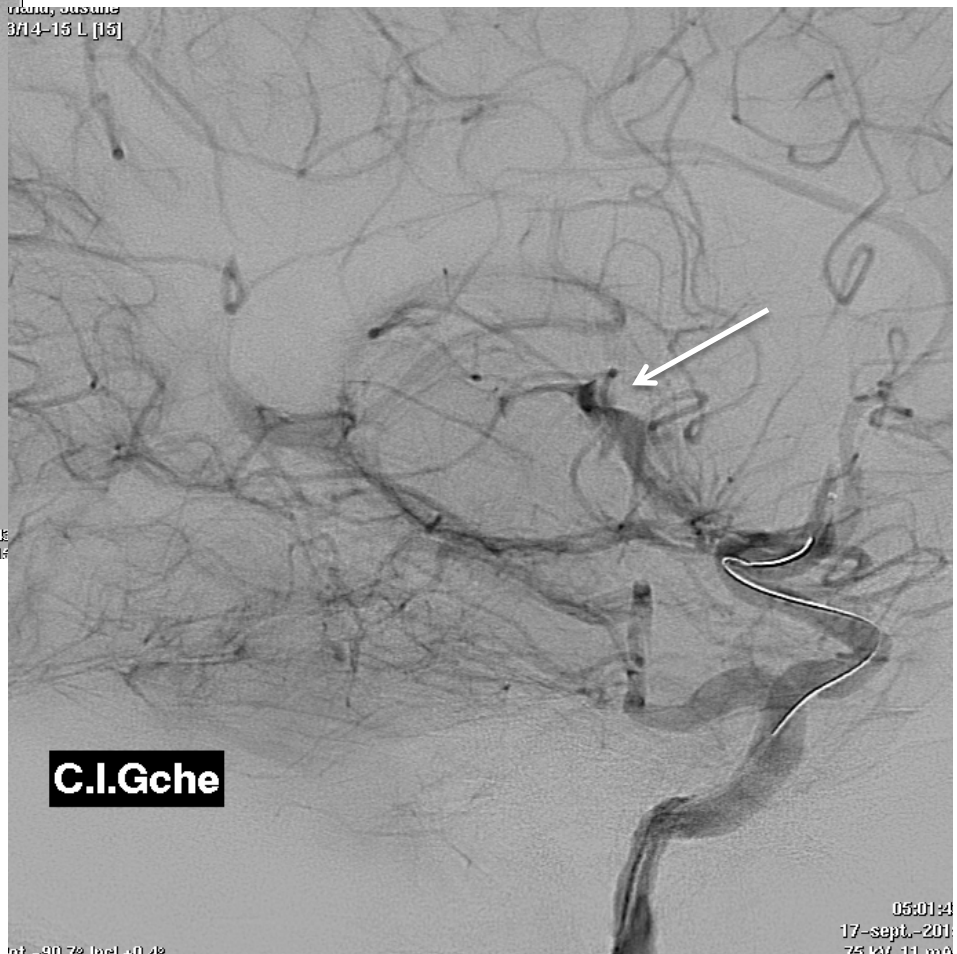
Après 2 passages

Après 3 passages

Hémorragie majeure

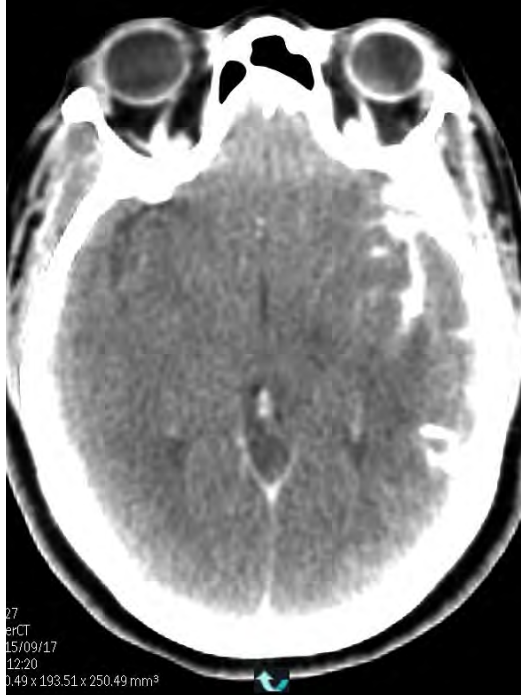
Après TPA

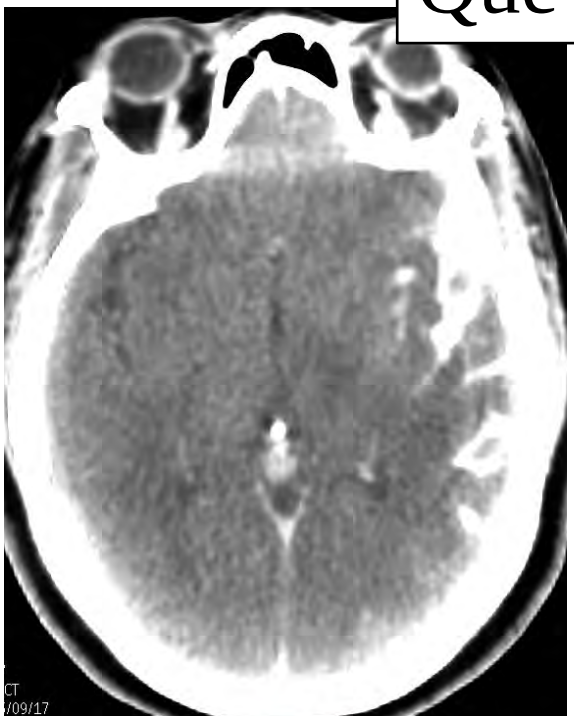
Que faire?

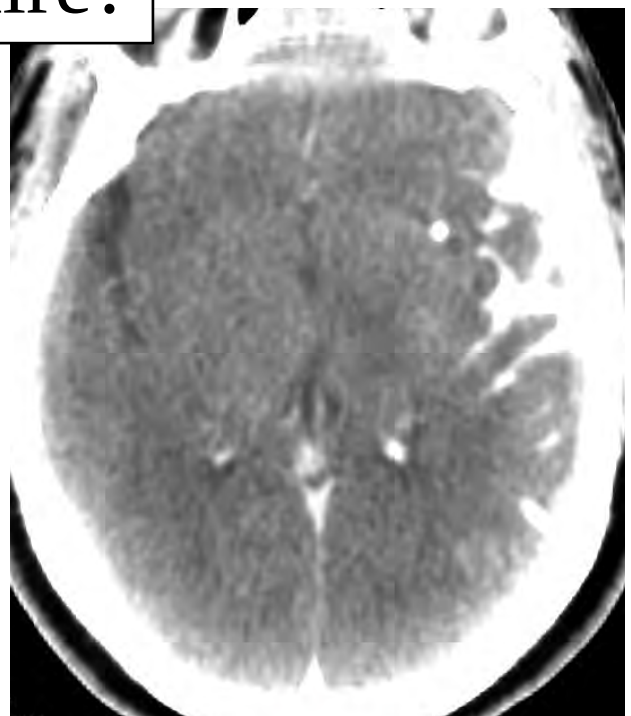


Lors du 4 ième passage

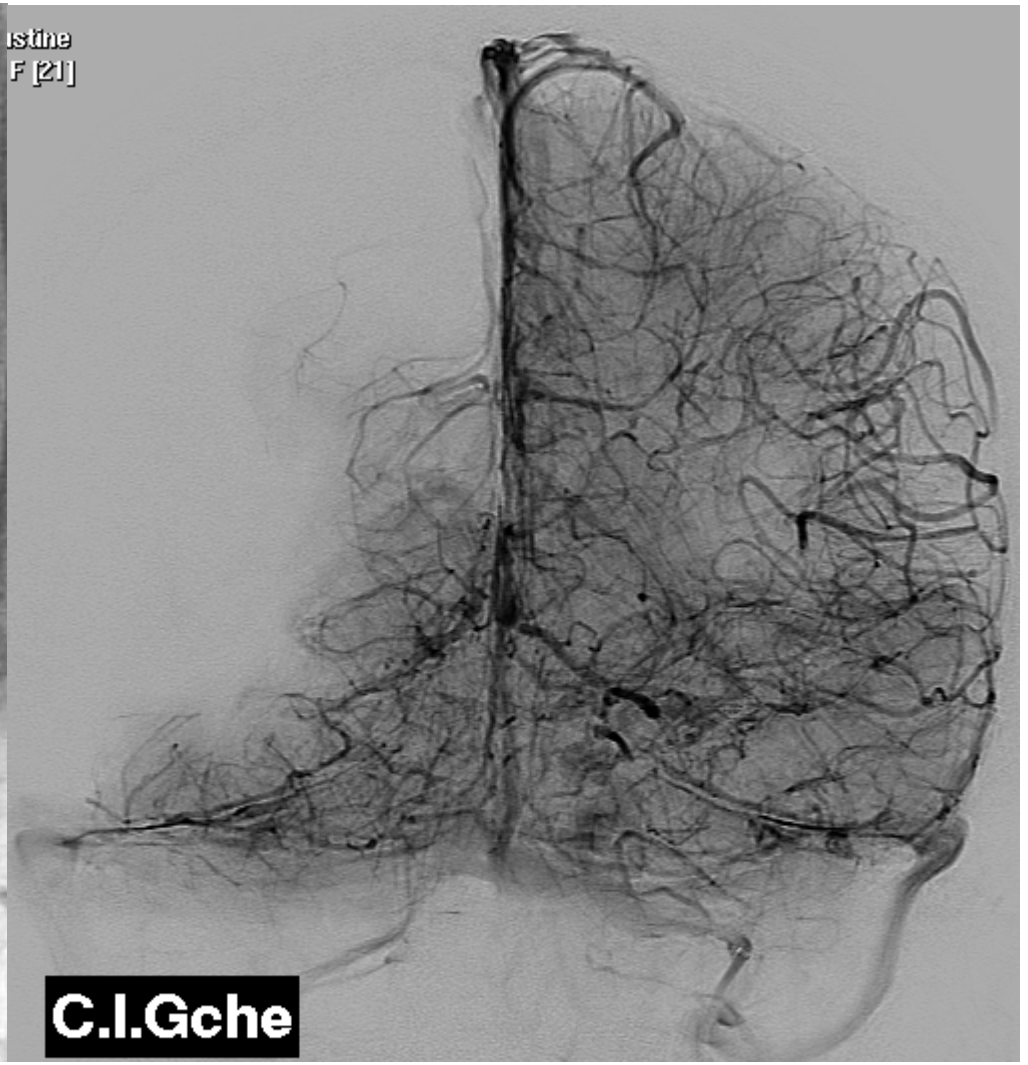
Que faire?

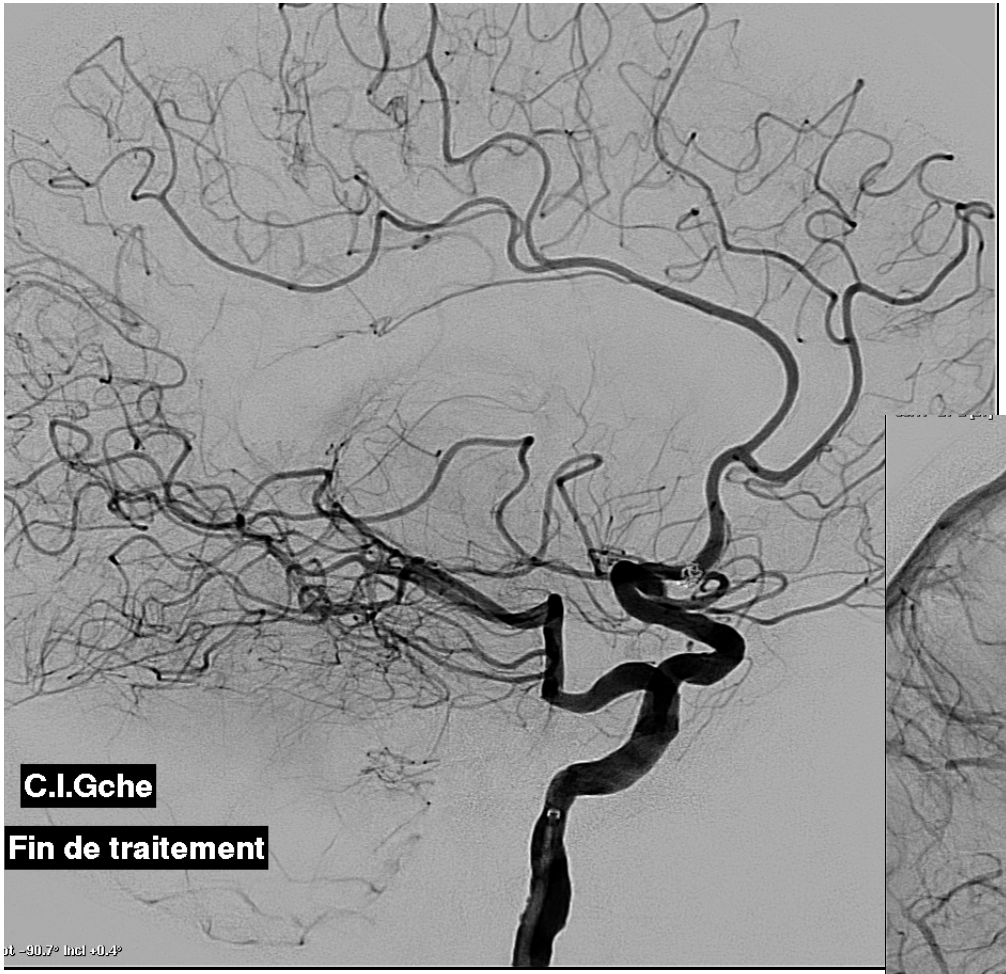






Occlusion de M2

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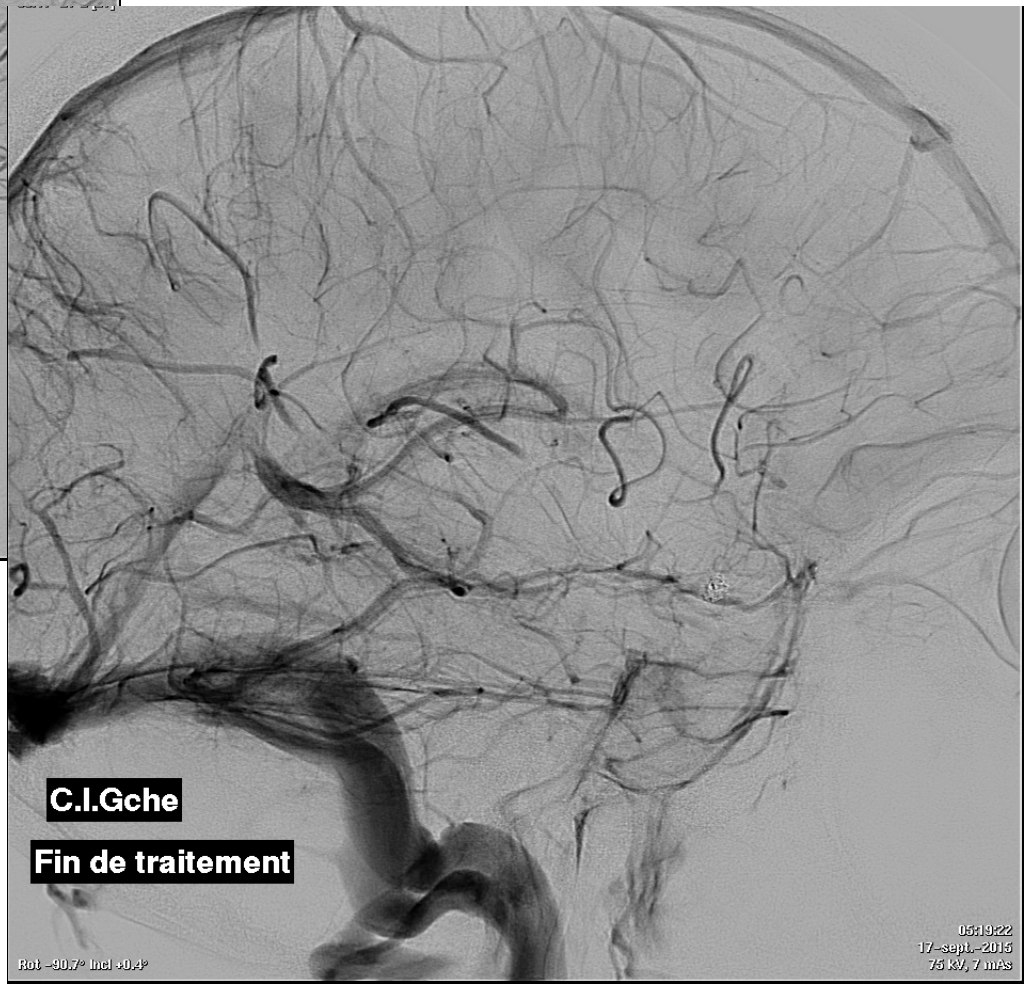
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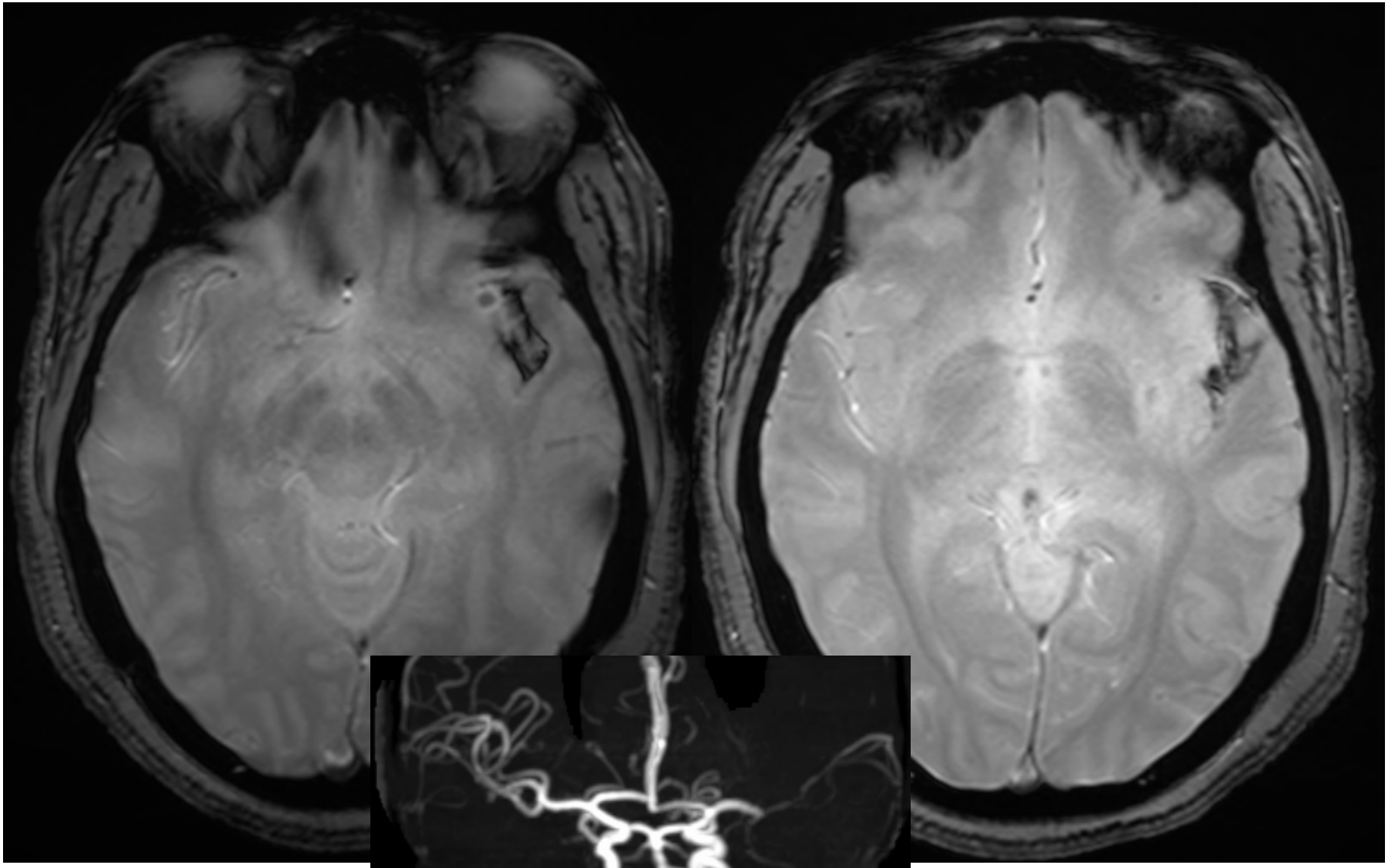
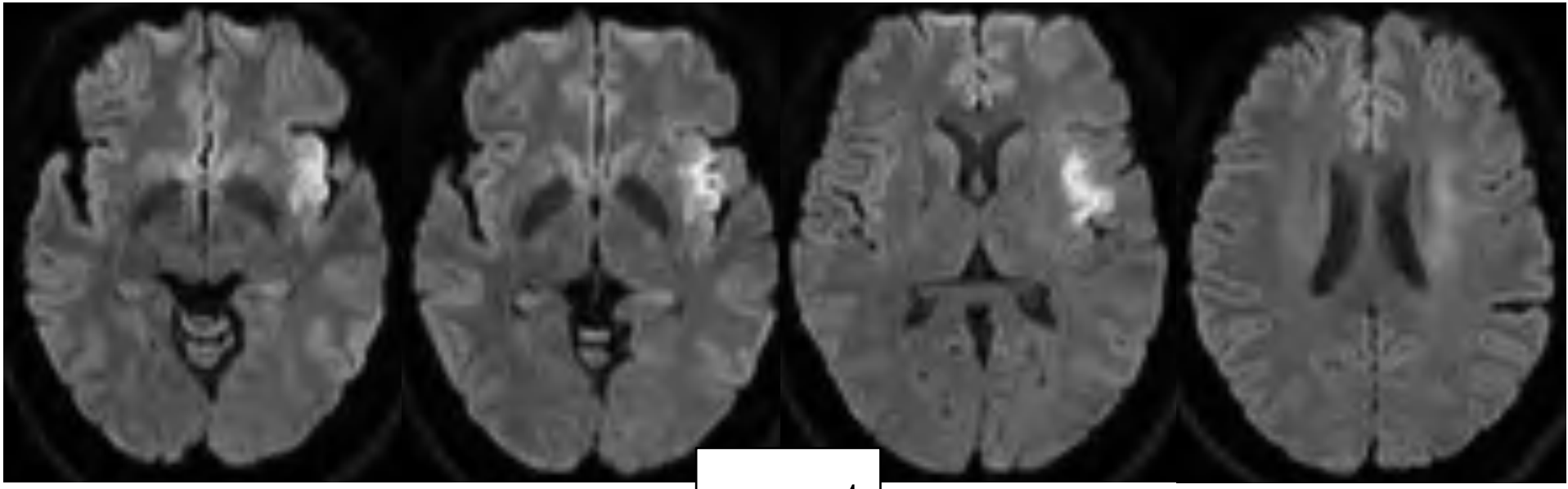
75 kV, 7 mAs





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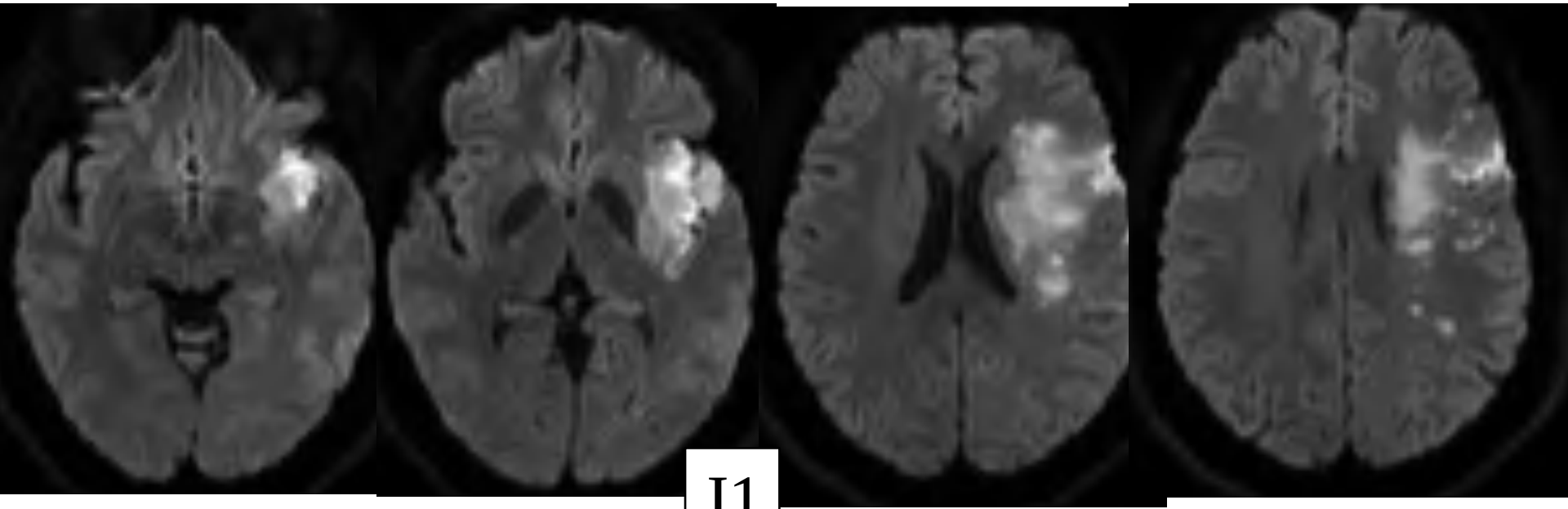
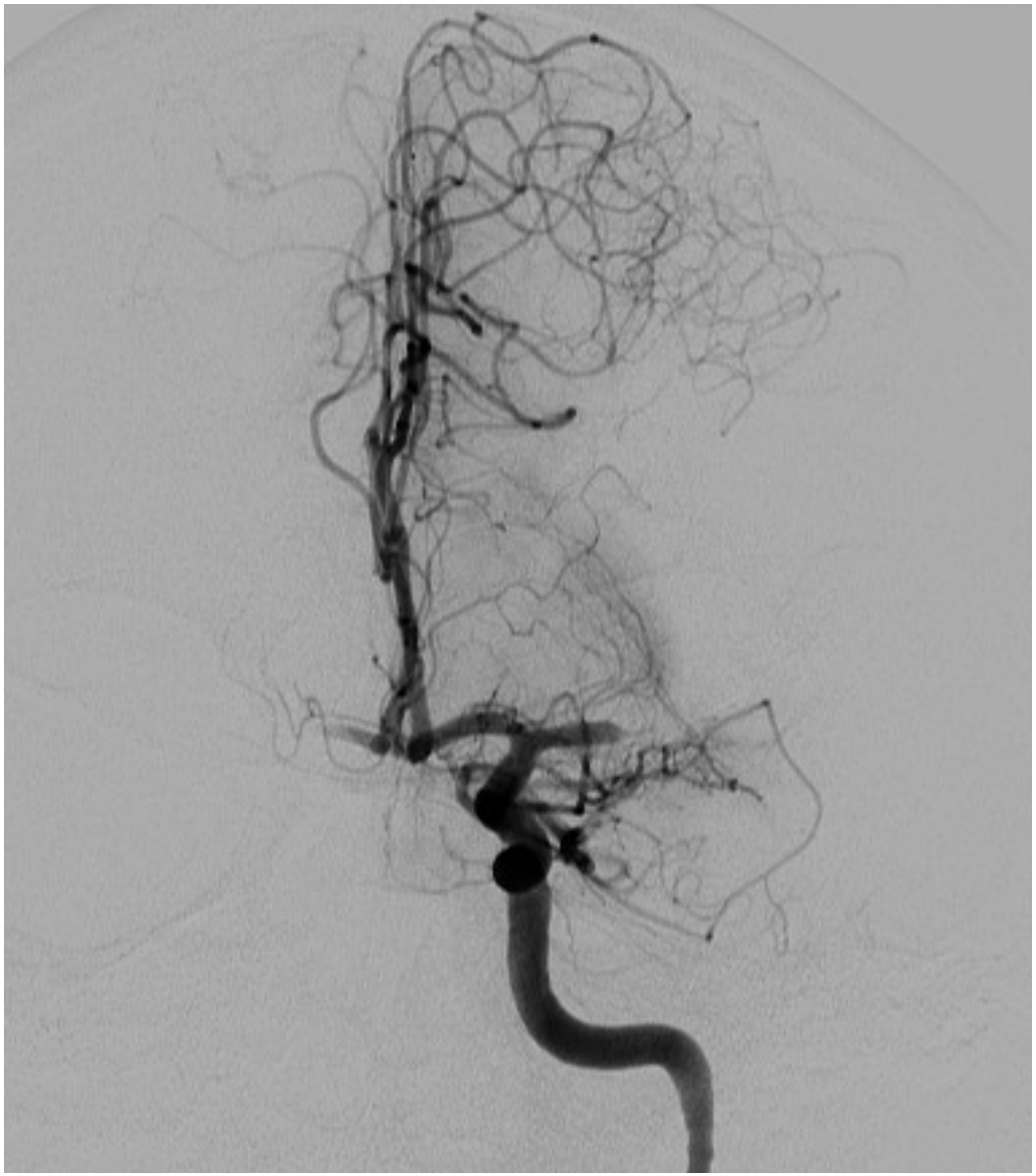
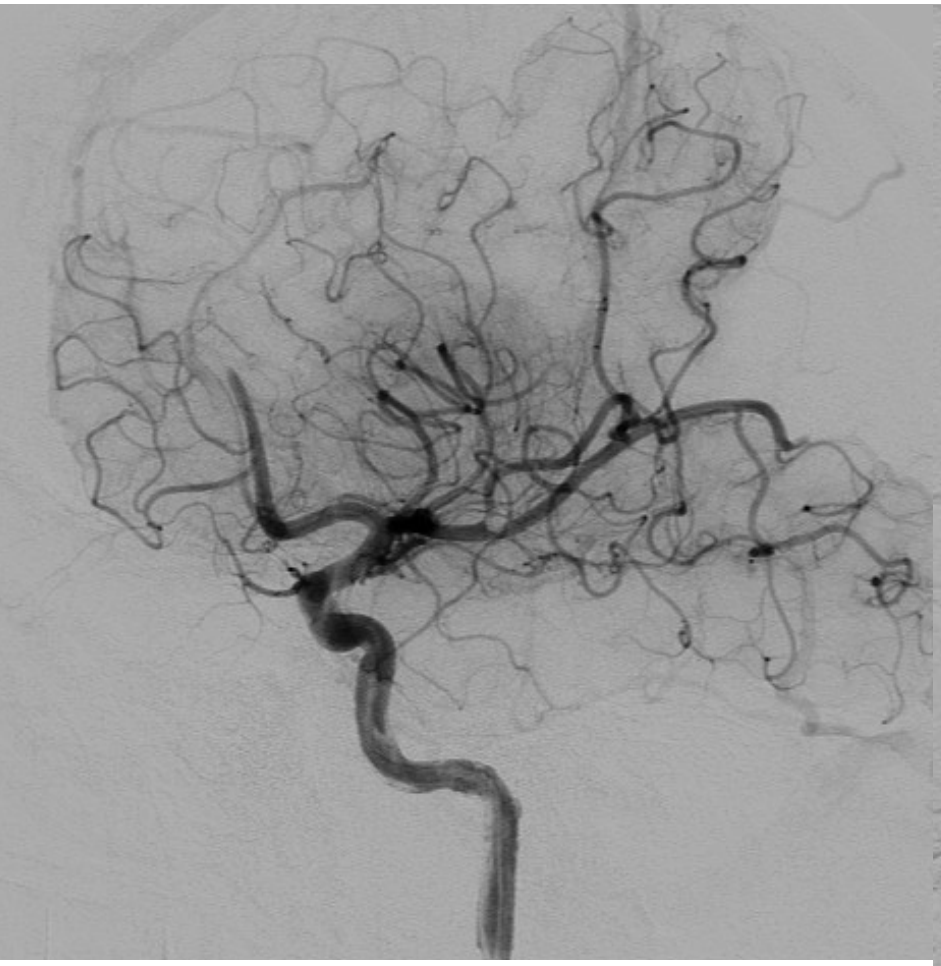
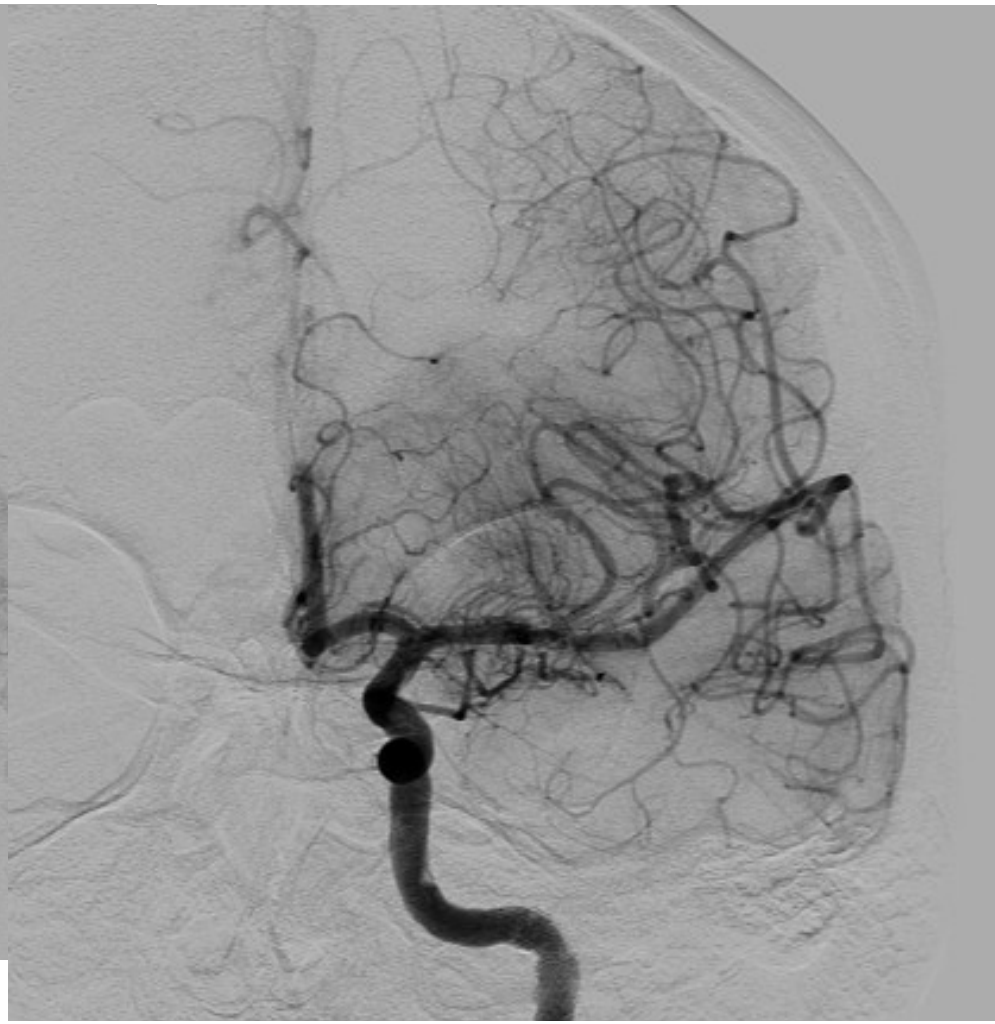


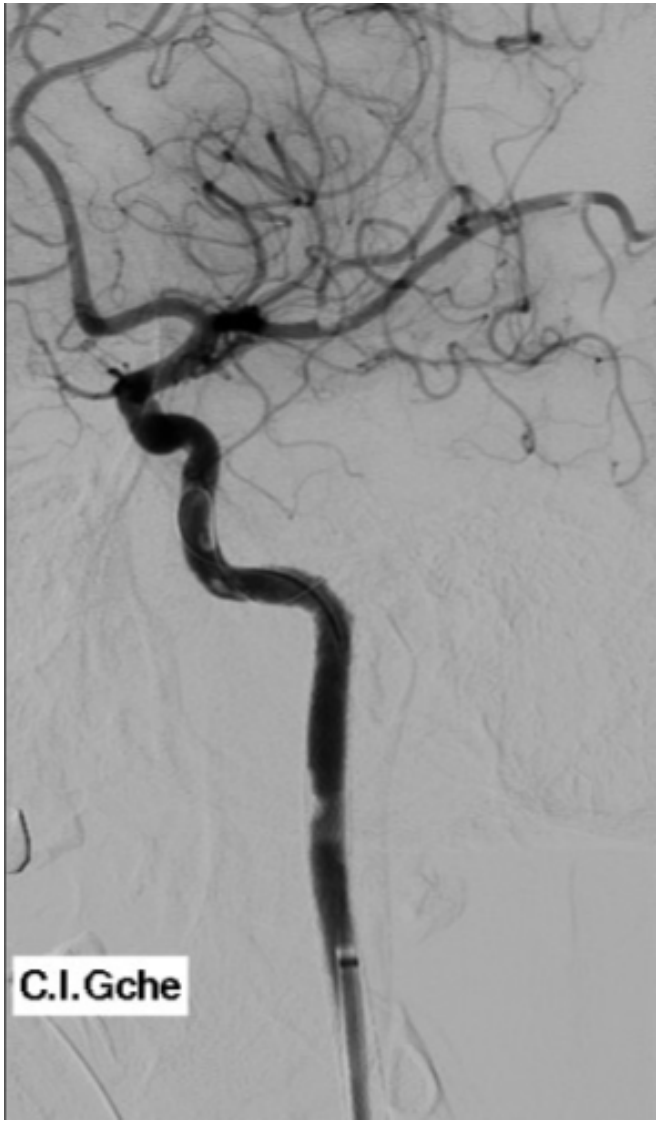
J1



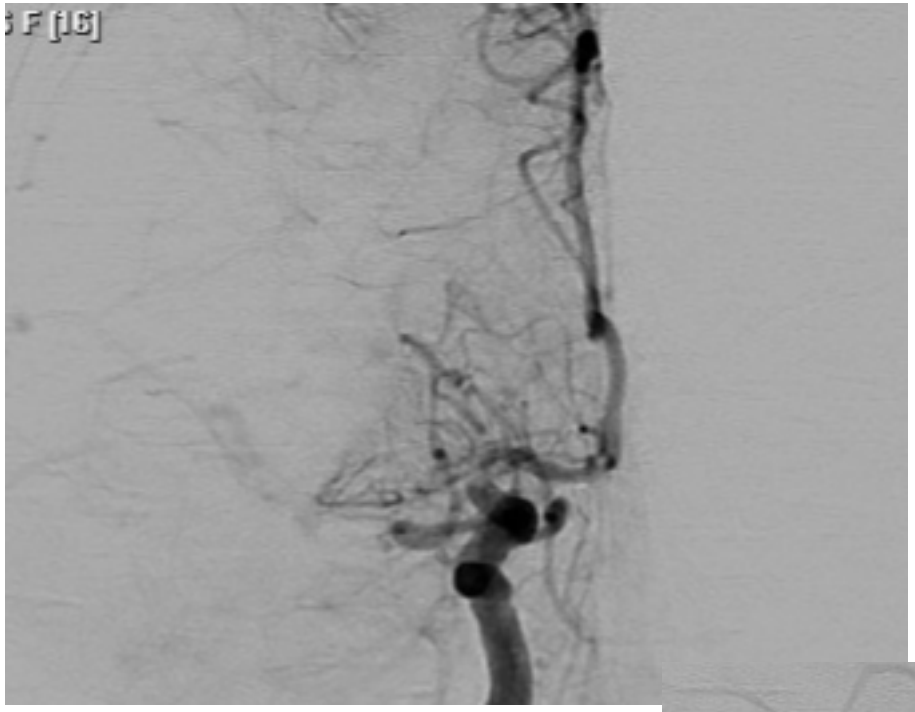




QUE FAIRE?



Le temps de s'occuper de la carotide …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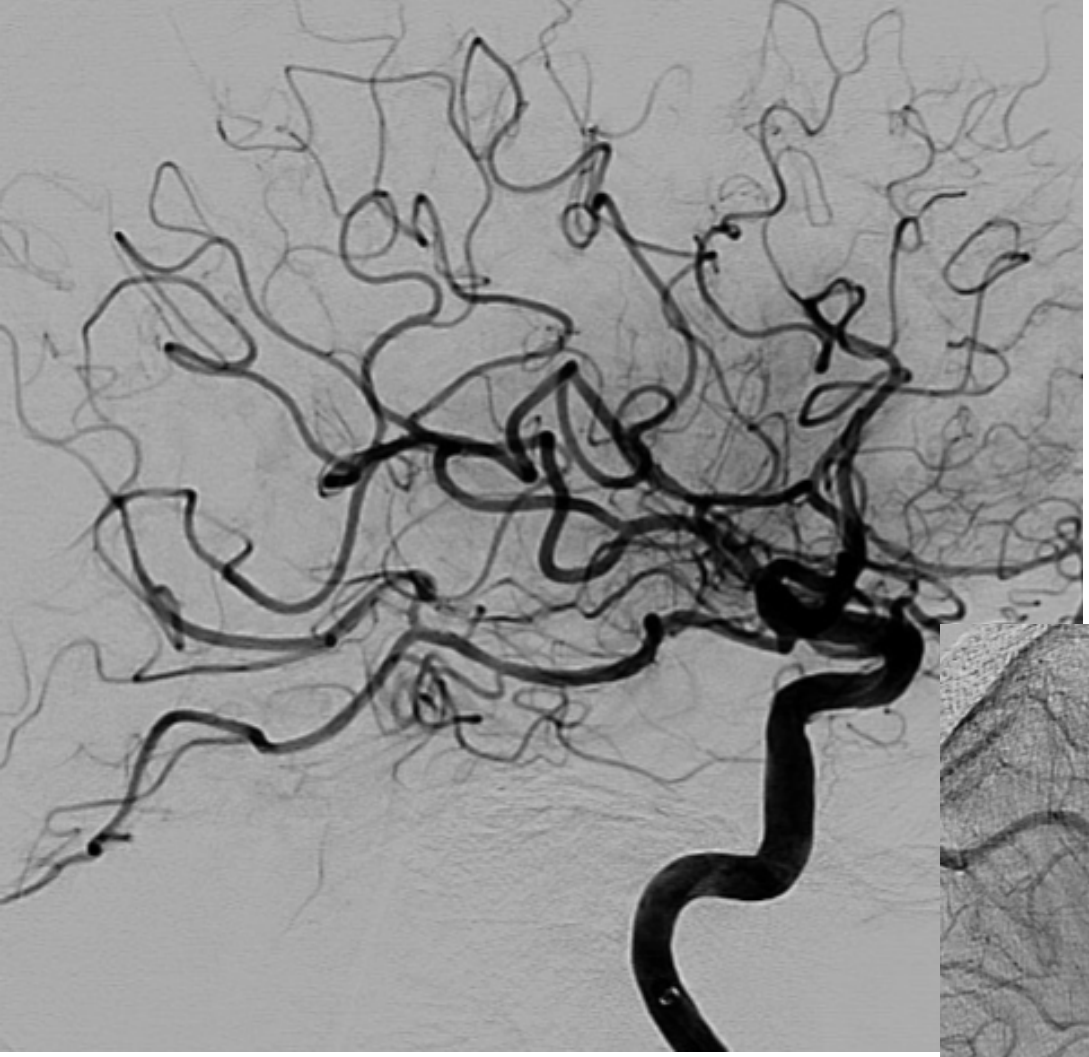
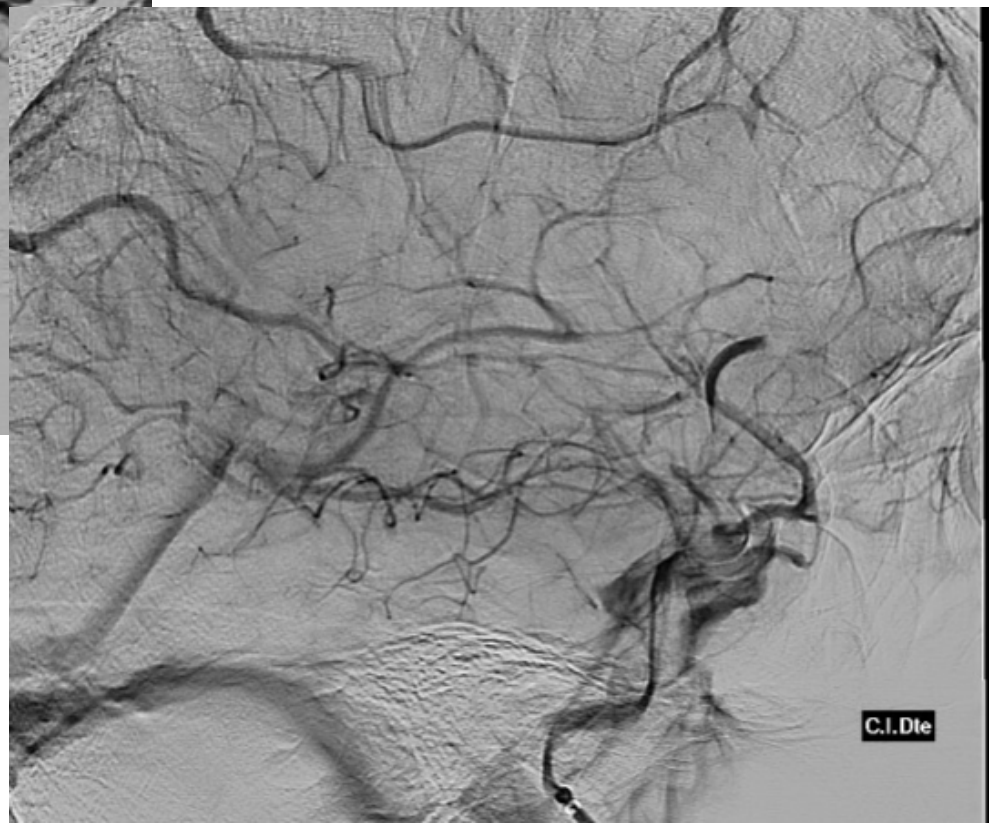
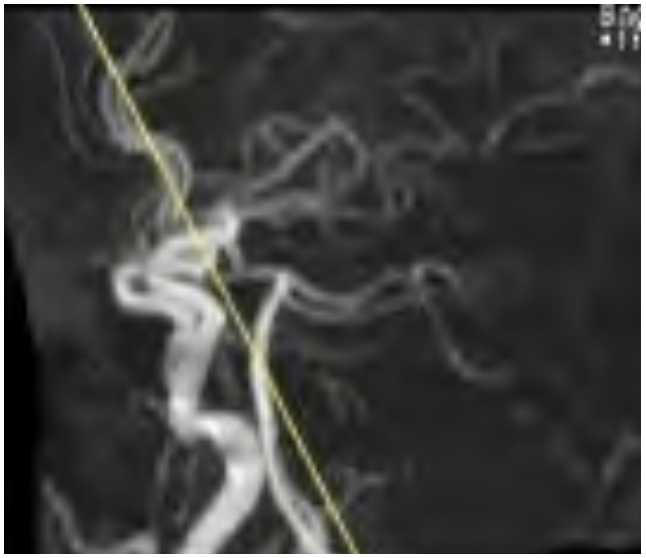
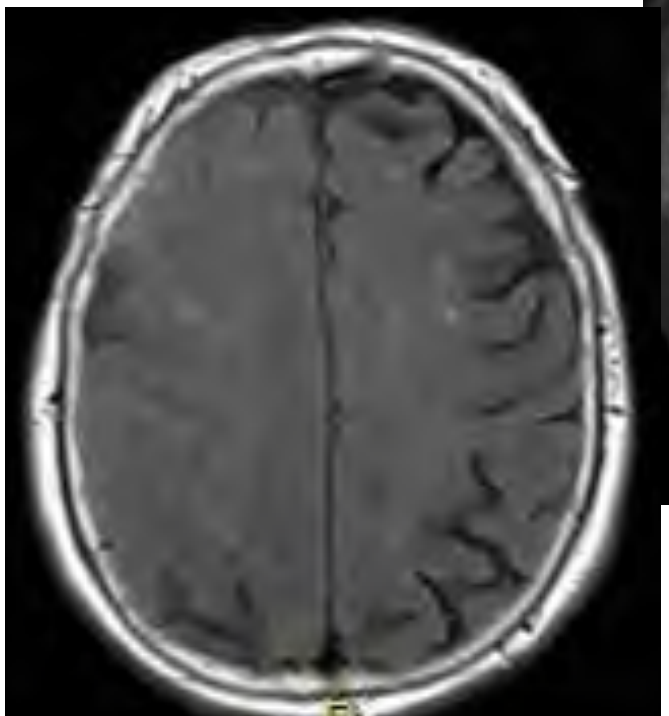


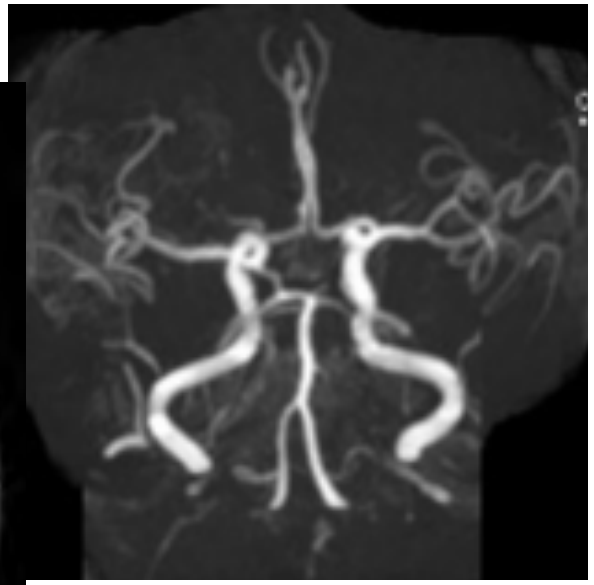
TICI 2c…



Contrôle à J1







Thrombectomie distale

POUR

- Passer du TICI 2A – 2B
- 2B à 2c-3
- Si pas de tPA
- Aire éloquente
- Territoire en pénombre
- ENT

CONTRE

- Risque de perforation
- Non validé
- Le tPA peut suffire
- Rupture si tPA ….

Peut valoir le RISQUE.
Mais on peut tout perdre.
TPA efficace sur les petits embols.

QUAND S'ARRETER?

TICI 2A ?

TICI 2B

TICI 2c

TICI 3

QUAND S'ARRETER: TIMING?

Microcatheter to Recanalization (Procedure Time) Predicts Outcomes in Endovascular Treatment in Patients with Acute Ischemic Stroke: When Do We Stop?

A.E. Hassan, S.A. Chaudhry, J.T. Miley, R. Khatri, S.A. Hassan, M.F.K. Suri, and A.I. Qureshi

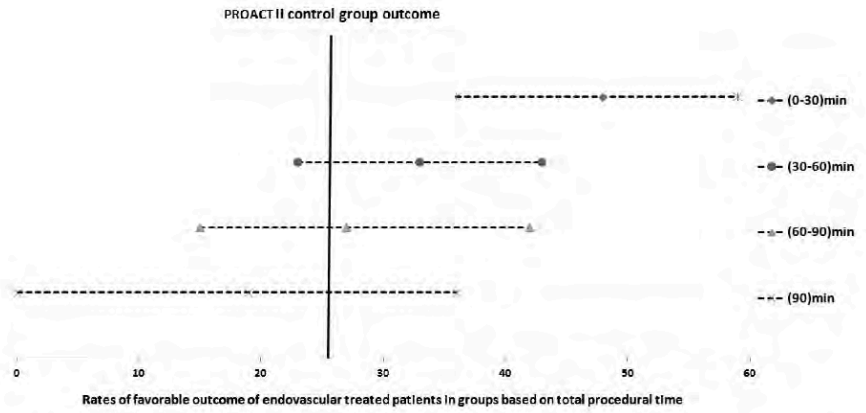
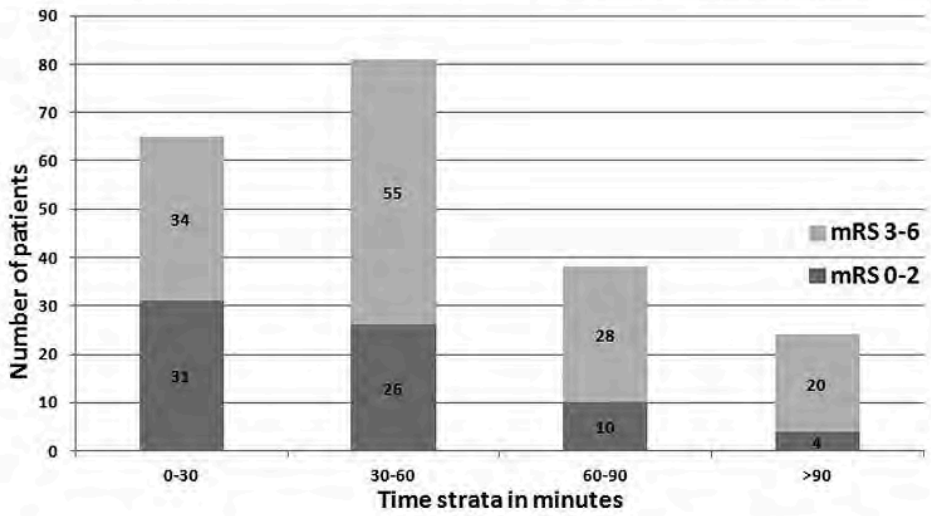


FIG 1. Rates of favorable outcome of endovascularly treated patients in groups based on total procedure time in comparison with rates observed in placebo-treated PROACT II patients.

FIG 2. Rates of angiographic recanalization in endovascularly treated patients in groups based on total procedure time.



AJNR Am J Neuroradiol 34:354–59 Feb 2013

Le geste est futile après 60 min ?

QUAND ET OU S'ARRETER?

- TICI 3 c'est mieux
- Plus c'est distal , plus c'est risqué: perforation++
- Rapport bénéfice risque:

  Aphasie et M2 G ++

  laisser la chance à l'IV : distaux
- Changer de stratégie en cas d'échec et penser à une autre étiologie

Comment progresser ?

- Comprendre la composition du caillot pour adapter la meilleure technique

- Un outil simple de mesure de perfusion pour décider de poursuivre ou non dans l'effort de recanalisation