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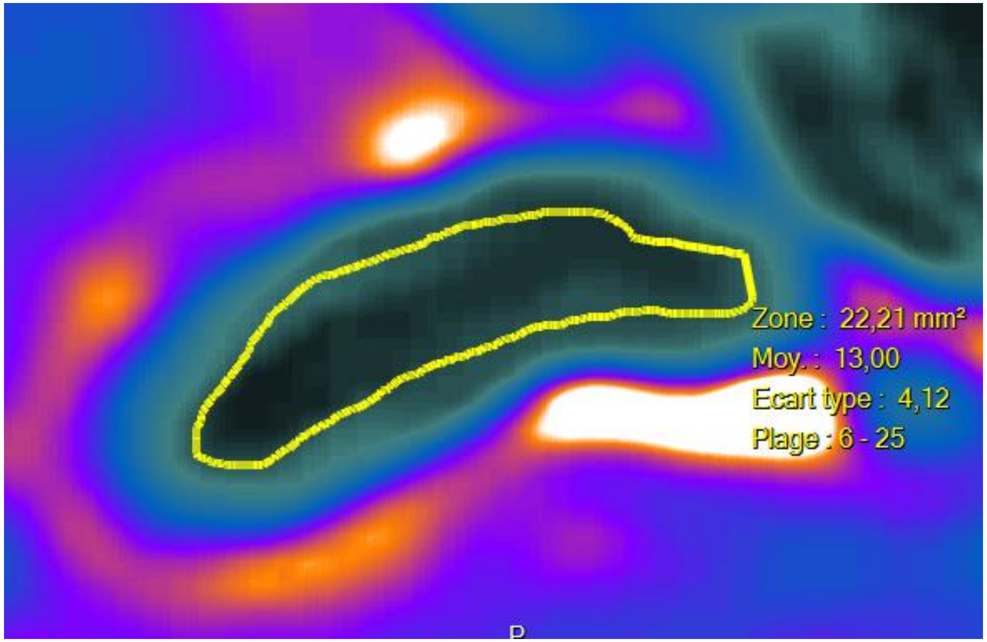
Imagerie des occlusions artérielles à la phase aiguë de l'AVC ischémique



Romain Bourcier (CHU de Nantes)

Claire Toquet, Lili Detraz, Elisabeth Auffray-Calvier, Benjamin Daumas Duport, Alina Lintia-Gaultier, Cédric Lenoble, Pierre-Louis Alexandre,Jean Michel Serfaty, Hubert Desal.

Ecole de la Thrombectomie 2024

NeuroRadiologie
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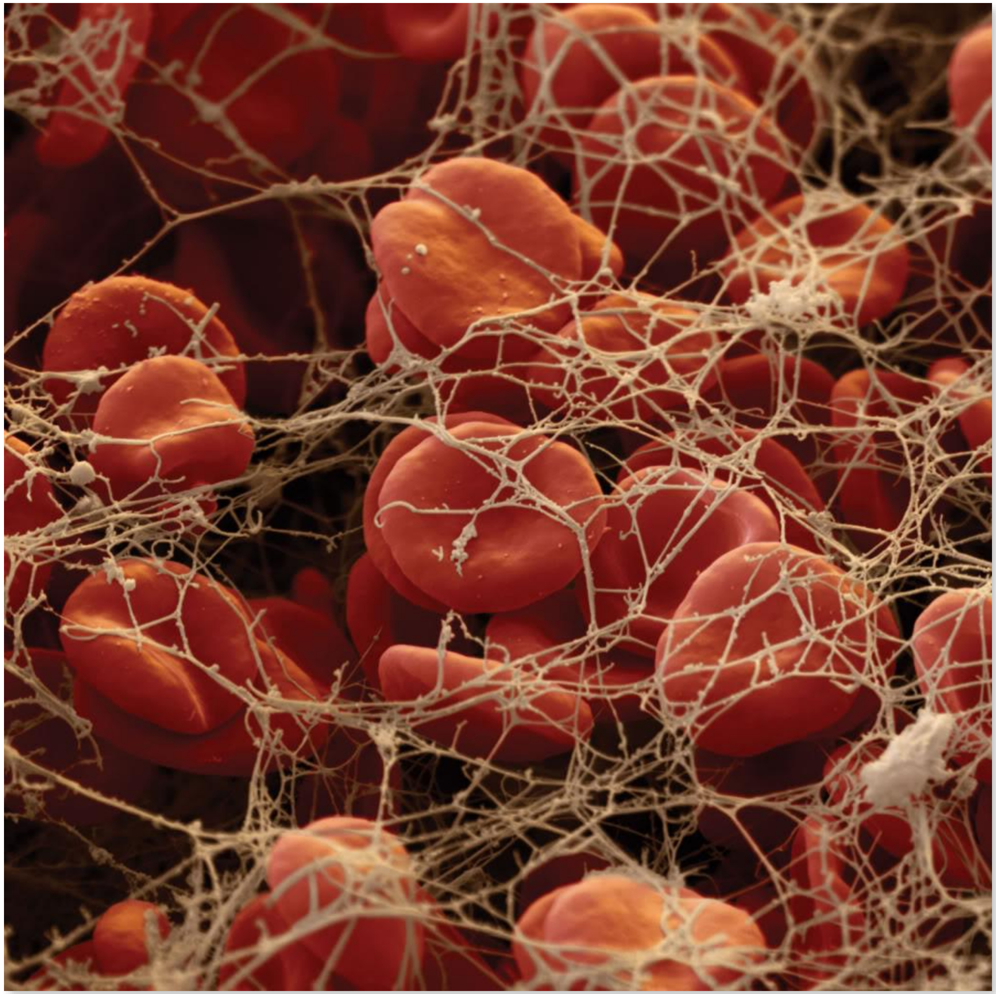
Conflits d’intérêts

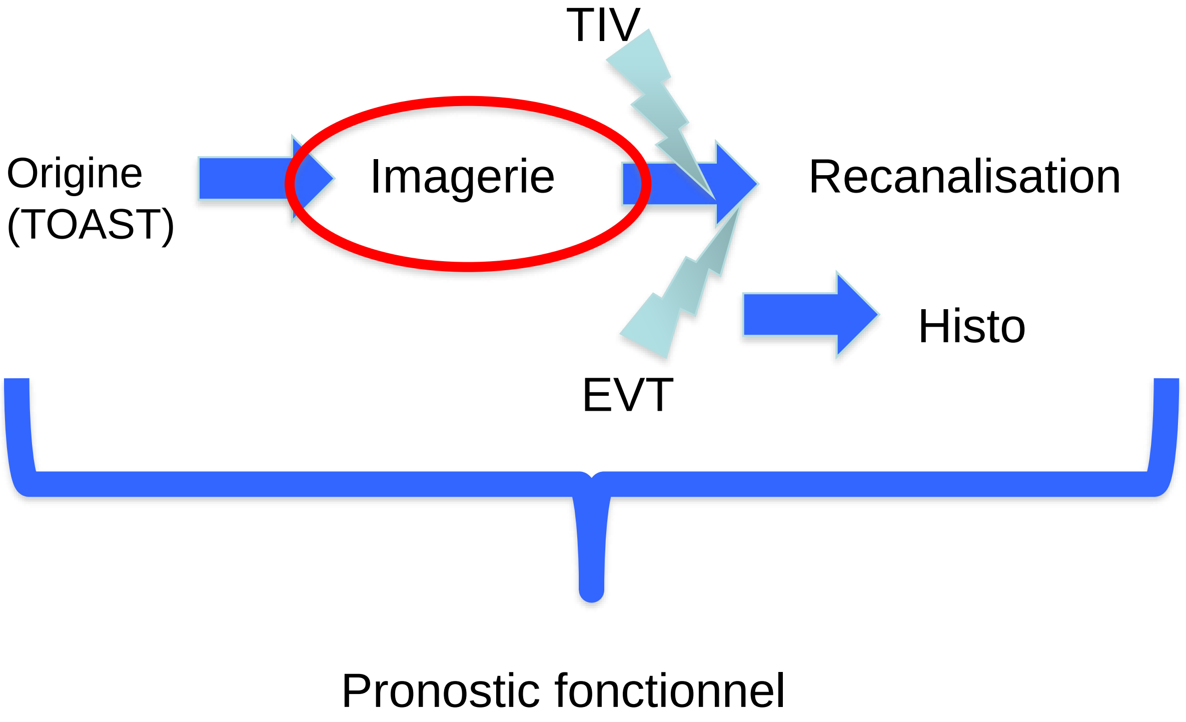
- Consulting Cerenovus
- Paid lectures for Penumbra, Microvention, Medtronic

Tout commence par une artère occluse !



Mais à la différence des coronaires …

Le thrombus …



TIV
Origine
(TOAST)
Imagerie
Recanalisation
Histo
EVT
Pronostic fonctionnel

Analyse du thrombus – Pourquoi?

- Thrombus varie selon l'etiologie ?

Analyse du thrombus – Pourquoi?

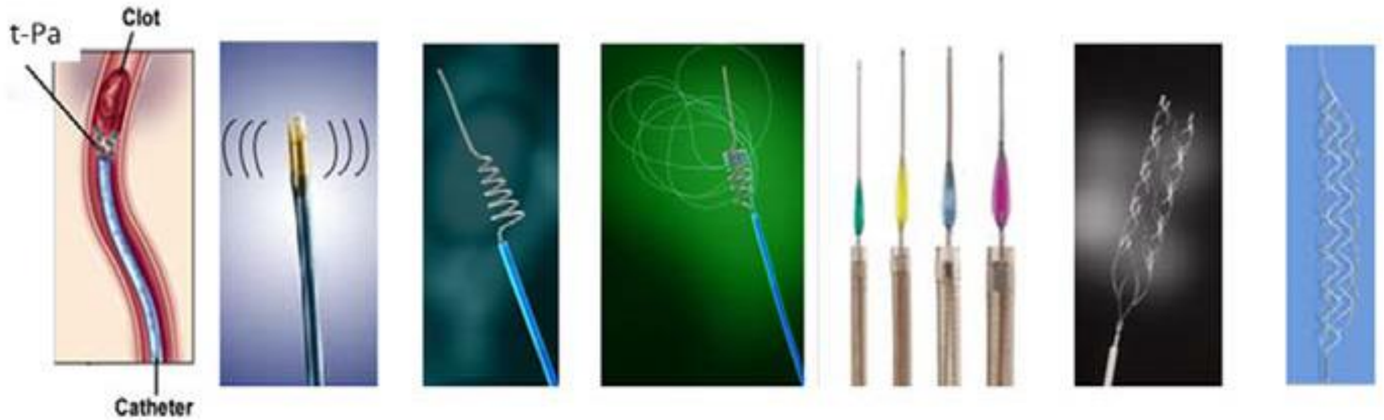
- Etiologie → Prevention secondaire

Analyse du thrombus – Pourquoi?

- Etiologie ➔ Prevention secondaire
- Recanalisation dépend du thrombus

LES techniques de revascularisation endovasculaire

- Angioplastie - stenting
- Lasso
- Merci
- Fibrinolyse IA



- Aspiration, seule ou combinée, mega DAC
- SR, double SR, SR nouvelle génération

Analyse du thrombus – Pourquoi?

- Etiologie → Prevention secondaire
- Recanalisation liée au pronostic clinique

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CENTRE HOSPITALIER UNIVERSITAIRE DE NANTES

Résultats angiographiques du traitement endovasculaire aujourd'hui

~ 90 % de TICI 2**b**/3 final

MAIS

~ 65 % de TICI 2**c**/3 en ≤ **3 passes**

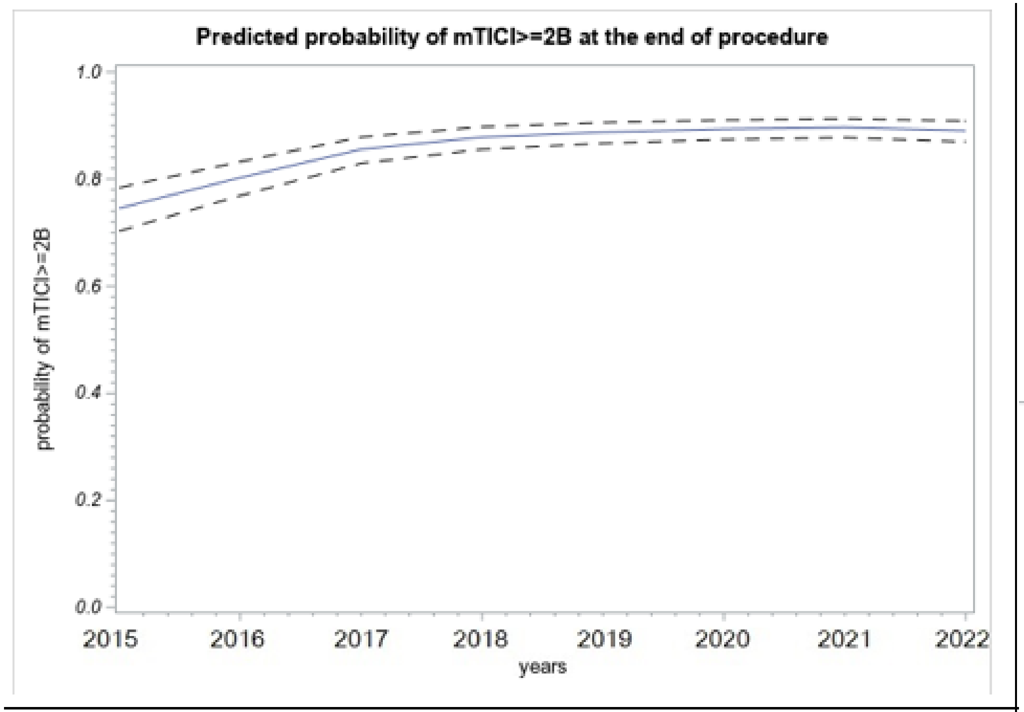
ET

~ 35 % de TICI 3 en 1 passe

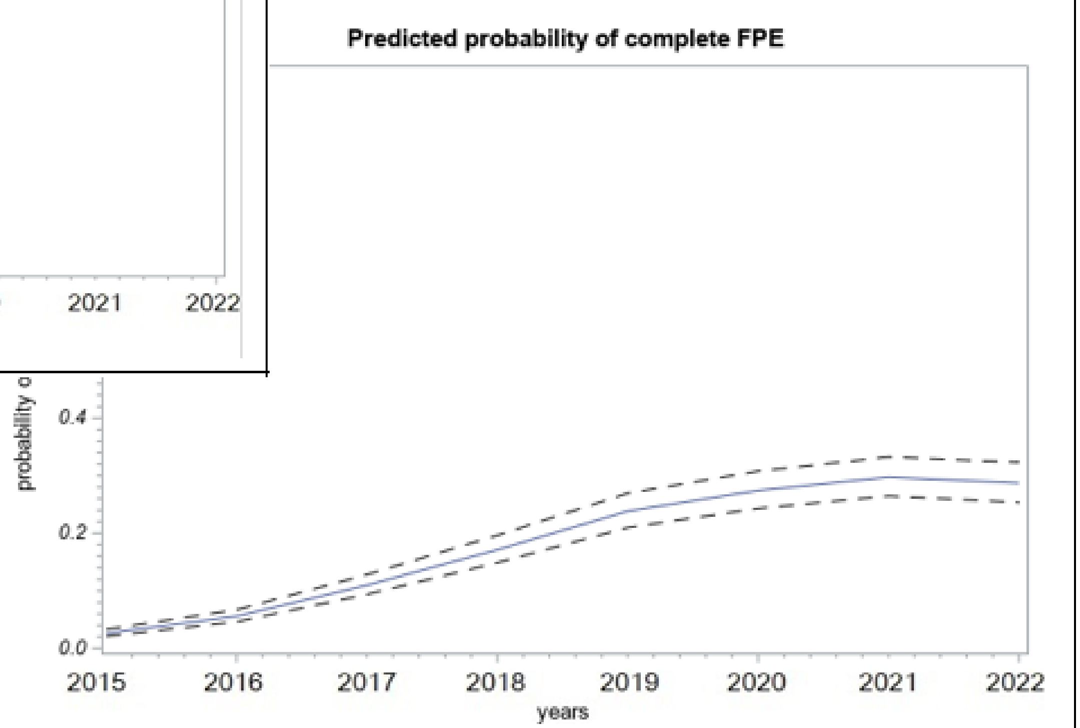
Primary Results of the Multicenter ARISE II Study (Analysis of Revascularization in Ischemic Stroke With EmboTrap) O. Zaidat et al. Stroke 2018

First Pass Effect, A New Measure for Stroke Thrombectomy Devices O. Zaidat, et al. Stroke 2018

Temporal trends for results of Endovascular treatment of large cerebral vessel occlusion: a 7-year study



6104 patients



Bourcier et al. ESJ 2022

Analyse du thrombus – Pourquoi?

- Etiologie ➔ Prevention secondaire
- Recanalisation liée au pronostic clinique
- *Pb= avant le retirer, on ne connait pas le thrombus…*

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Histologie

Analysis of Thrombi Retrieved From Cerebral Arteries of Patients With Acute Ischemic Stroke

Victor J. Marder, MD; Dennis J. Chute, MD; Sidney Starkman, MD; Anna M. Abolian; Chelsea Kidwell, MD; David Liebeskind, MD; Bruce Ovbiagele, MD; Fernando Vinuela, MD; Gary Duckwiler, MD; Reza Jahan, MD; Paul M. Vespa, MD; Scott Selco, MD, PhD; Venkatakrishna Rajajee, MD; Doojin Kim, MD; Nerses Sanossian, MD; Jeffrey L. Saver, MD

Background and Purpose—Information regarding the histological structure of thromboemboli that cause acute stroke provides insight into pathogenesis and clinical management.

Methods—This report describes the histological analysis of thromboemboli retrieved by endovascular mechanical extraction from the middle cerebral artery (MCA) and intracranial carotid artery (ICA) of 25 patients with acute ischemic stroke.

Results—The large majority (75%) of thromboemboli shared architectural features of random fibrin:platelet deposits interspersed with linear collections of nucleated cells (monocytes and neutrophils) and confined erythrocyte-rich regions. This histology was prevalent with both cardioembolic and atherosclerotic sources of embolism. "Red" clots composed uniquely of erythrocytes were uncommon and observed only with incomplete extractions, and cholesterol crystals were notably absent. The histology of thromboemboli that could not be retrieved from 29 concurrent patients may be different. No thrombus >3 mm wide caused stroke limited to the MCA, and no thrombus >5 mm wide was removed from the ICA. A mycotic embolus was successfully removed in 1 case, and a small atheroma and attached intima were removed without clinical consequence from another.

Conclusions—Thromboemboli retrieved from the MCA or intracranial ICA of patients with acute ischemic stroke have similar histological components, whether derived from cardiac or arterial sources. Embolus size determines ultimate destination, those >5 mm wide likely bypassing the cerebral vessels entirely. The fibrin:platelet pattern that dominates thromboembolic structure provides a foundation for both antiplatelet and anticoagulant treatment strategies in stroke prevention. (*Stroke*. **2006;37:2086-2093.**)

Key Words: cerebral arteries ■ thrombi

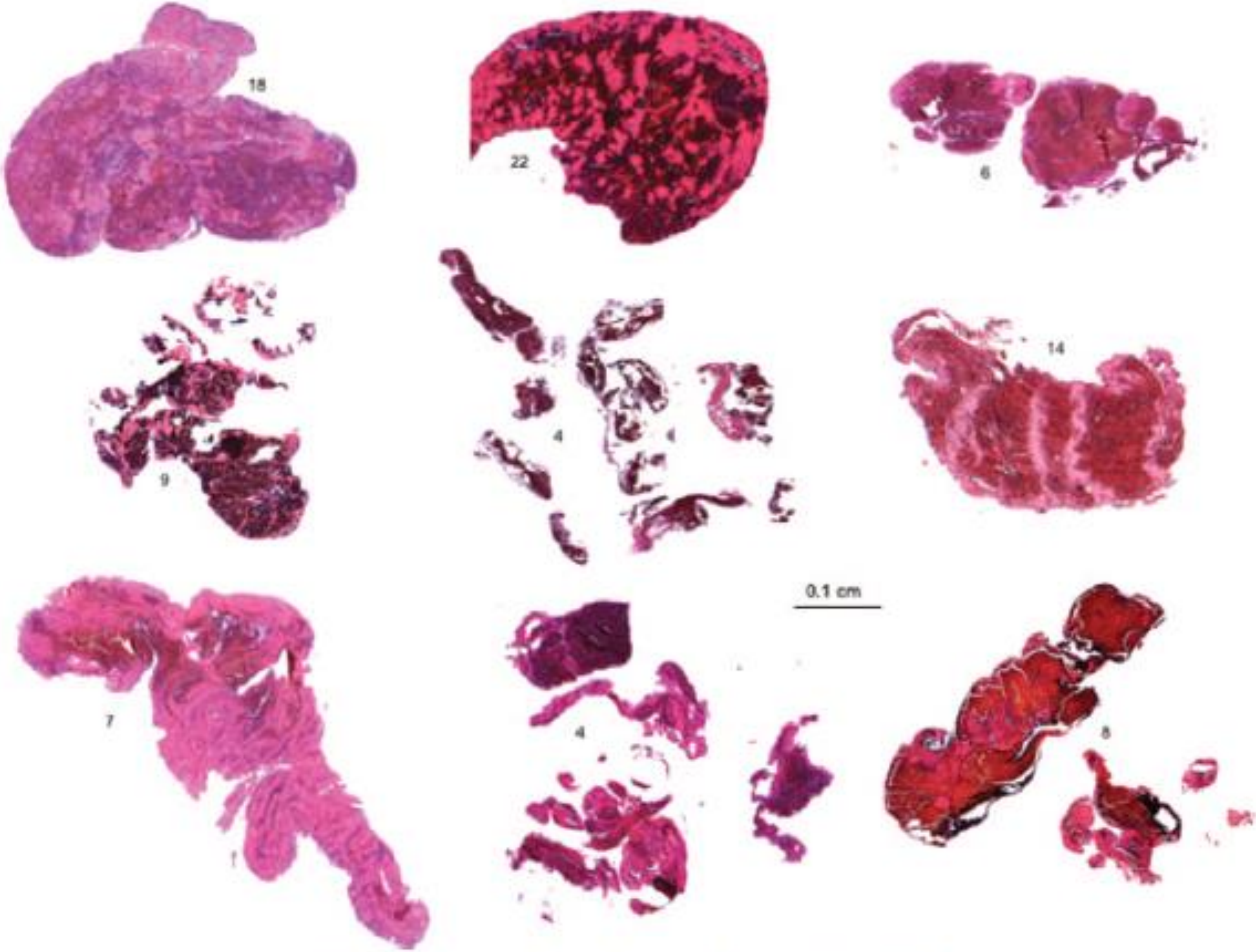
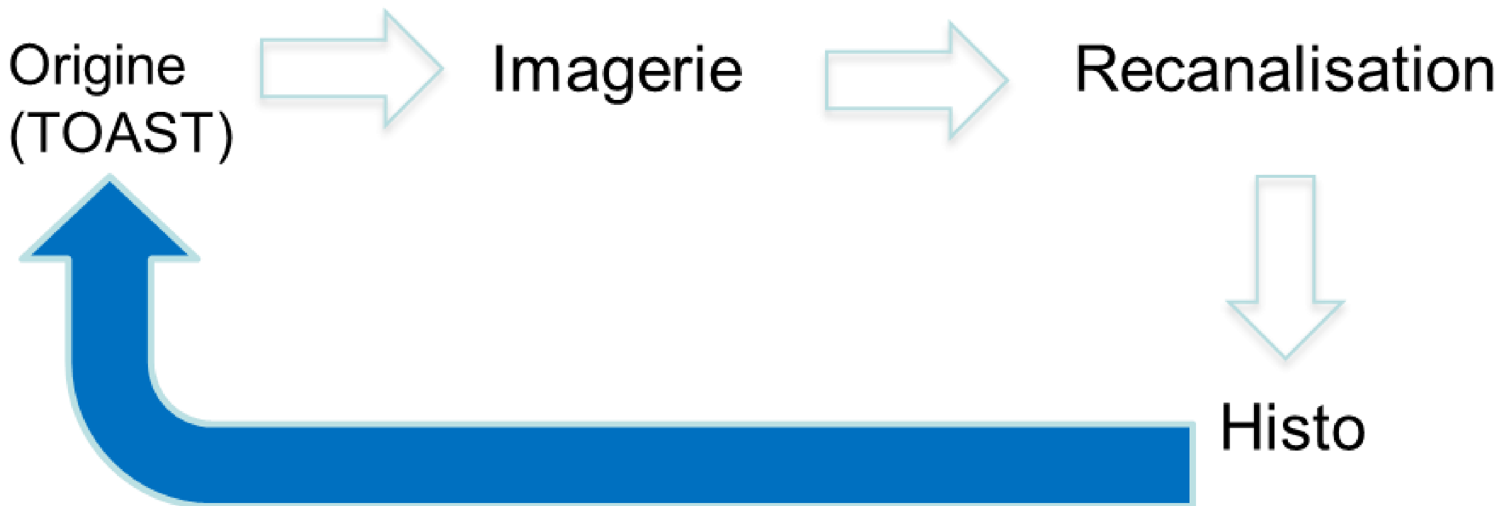


Figure 3. Hematoxylin and eosin–stained sections of 9 thrombi.


Origine
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Imagerie
Recanalisation
Histo

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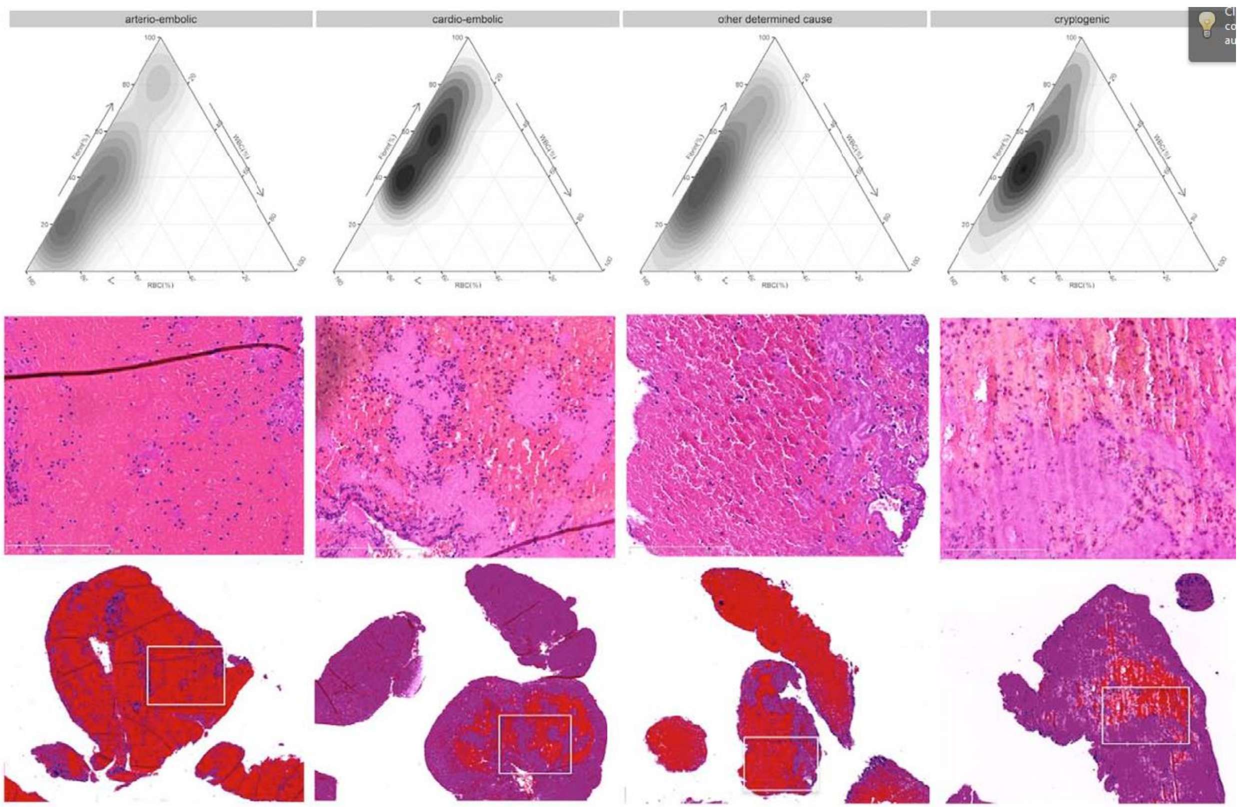
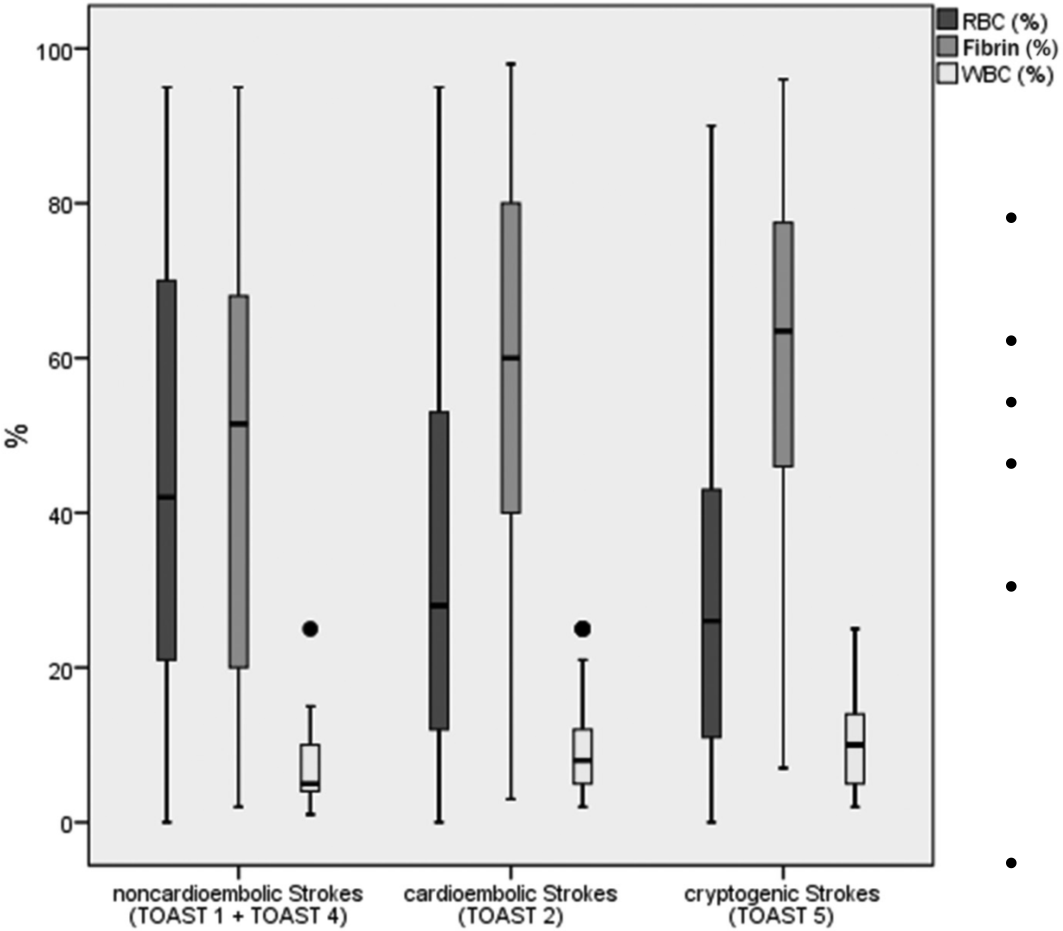
Original Contribution

Thrombus Histology Suggests Cardioembolic Cause in Cryptogenic Stroke

Tobias Boeckh-Behrens, MD; Justus F. Kleine, MD; Claus Zimmer, MD; Frauke Neff, MD;
Fabian Scheipl, PhD; Jaroslav Pelisek, PhD; Lucas Schirmer, MD; Kim Nguyen, MD;
Deniz Karatas, MSc; Holger Poppert, MD



Etiologie
et Histologie



- 187 patients

- 77 patients cardioemboliques
- 46 patients non cardio-embolique
- 64 patients cryptogénique

- cardio-emboliques plus élevées de fibrine/plaquettes (P=0,027), moins d'érythrocytes (P=0,005) plus de leucocytes (P=0,026)

- chevauchement cryptogènes et cardio-emboliques

Peter B. Sporns, et Stroke et al. 2017

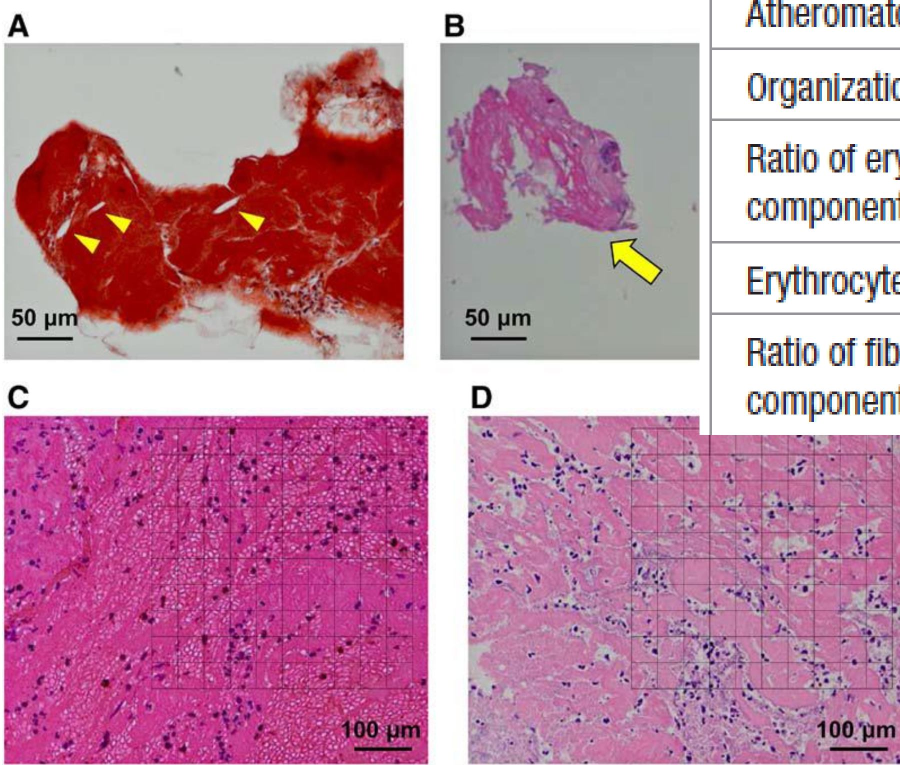

Origine
(TOAST)
Imagerie
Recanalisation
Histo

Recanalisation EVT et Histologie

Histopathologic Analysis of Retrieved Thrombi Associated With Successful Reperfusion After Acute Stroke Thrombectomy

Tetsuya Hashimoto, MD; Mikito Hayakawa, MD; Naoko Funatsu, MD;

	Overall (n=83)	mTICI 2b–3 (n=58)	mTICI 0–2a (n=25)	*P* Value*
Atheromatous gruel	7 (8)	2 (3)	5 (20)	0.024
Organization	19 (23)	16 (28)	3 (12)	0.159
Ratio of erythrocyte components, mean±SD, %	53±24	57±23	47±24	0.042
Erythrocyte-rich thrombus†	34 (41)	29 (51)	5 (20)	0.014
Ratio of fibrin/platelet components, mean±SD, %	44±23	42±22	48±24	0.166



Thrombi humains extraits

➔ compositions variables mais …

➔ Biais inhérent à l'histologie dans ce contexte:

Techniques histo différentes

Analyse des caillots retirés seulement

Analyse partielle des caillots retirés

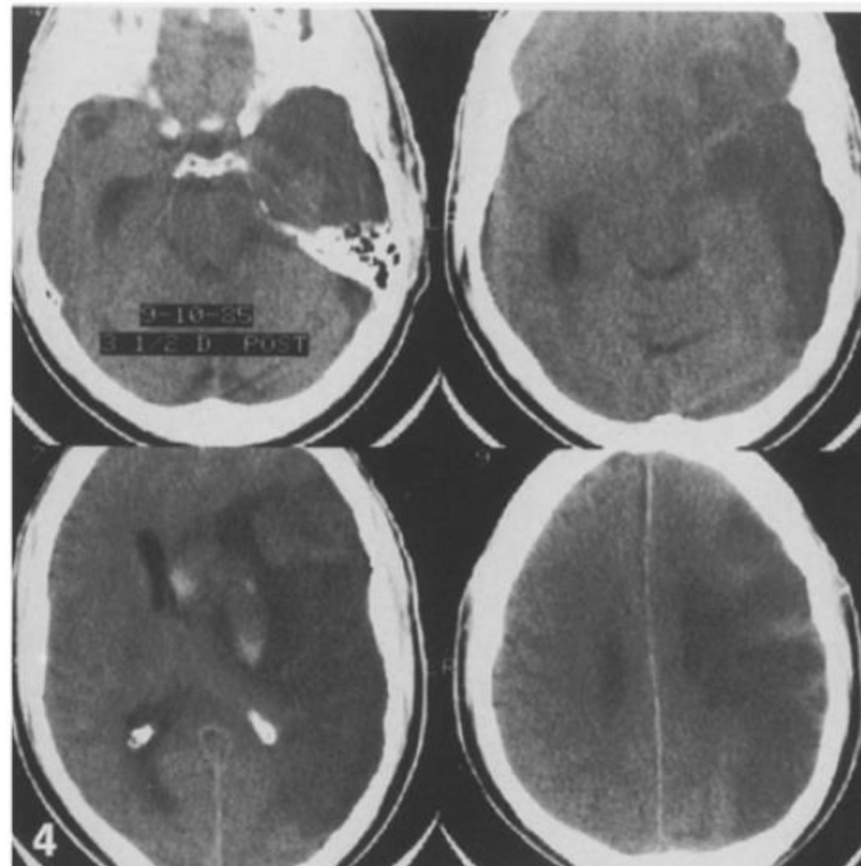
TIV entre avant l'histologie

Brinjiki et al. JNIS 2016

Imagerie de l'occlusion

Hyperdense middle cerebral artery: incidence and quantitative significance

T. A. Tomsick [1], T. G. Brott[2], C. P. Olinger [2], W. Barsan [3], J. Spilker [2], R. Eberle [2], and H. Adams [2,4]



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Radiology

Alex Rovira, MD
Patricia Orellana, MD
Jose Alvarez-Sabín, MD, PhD
Juan F. Arenillas, MD
Xavier Aymerich, MSc
Elisenda Grivé, MD
Carlos Molina, MD
Antoni Rovira-Gols, MD

Index terms:
Arteries, middle cerebral, 174.4311, 174.4312, 174.4352
Brain, infarction, 17.4352, 17.781, 174.4352, 174.781
Brain, MR, 174.121411, 174.121412, 174.121413, 174.121415, 174.121416, 174.12142, 174.12143, 174.12144
Magnetic resonance (MR), vascular studies, 17.12144, 174.12144

Published online before print
10.1148/radiol.2322030273
Radiology 2004; 232:466–473

Abbreviations:
DW = diffusion weighted
ICA = internal carotid artery
MCA = middle cerebral artery
NIHSS = National Institutes of Health Stroke Scale
PW = perfusion weighted

[1] From the Department of Radiology, Magnetic Resonance Unit (A.R., P.O., X.A., E.G., A.R.G.) and Department of Neurology, Cerebrovascular Unit (J.A.S., J.F.A., C.M.), Hospital Universitari Vall d'Hebron, Passeig Vall d'Hebron 119–129, 08035 Barcelona, Spain. Received February 19, 2003; revision requested

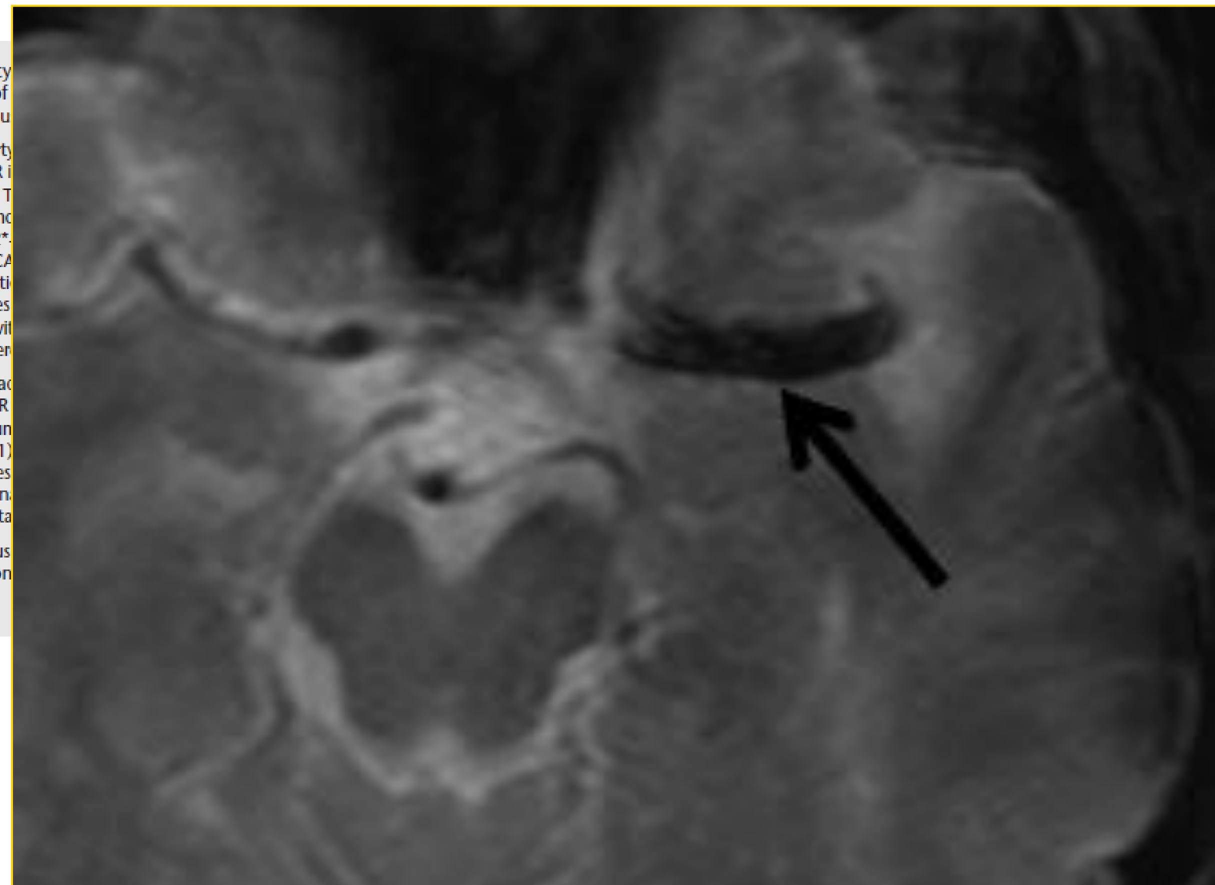
Hyperacute Ischemic Stroke: Middle Cerebral Artery Susceptibility Sign at Echo-planar Gradient-Echo MR Imaging[1]

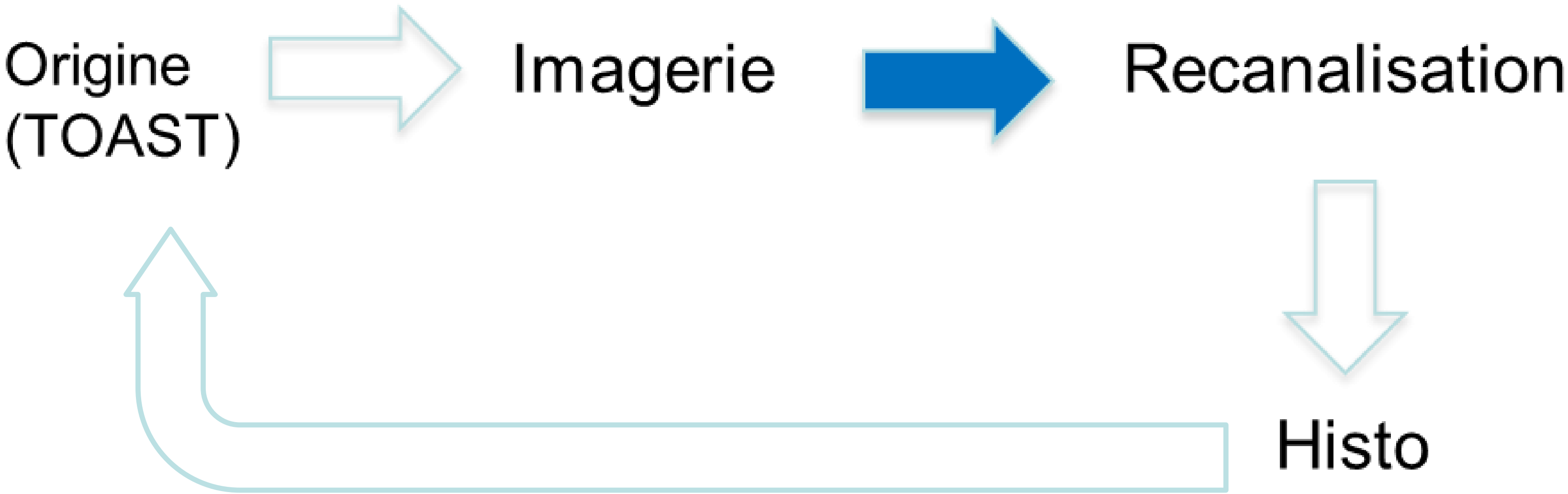
PURPOSE: To evaluate the accuracy
nance (MR) sequences in detection of
carotid artery (ICA) thrombotic occlu

MATERIALS AND METHODS: Forty
ing the MCA territory underwent MR i
examination included echo-planar T
perfusion-weighted (PW) imaging and
susceptibility sign on echo-planar T2*
thrombotic occlusion involving MCA
observers blinded to clinical informati
lesion volume on DW and PW images
susceptibility sign were evaluated wit
sidered to indicate a significant differ

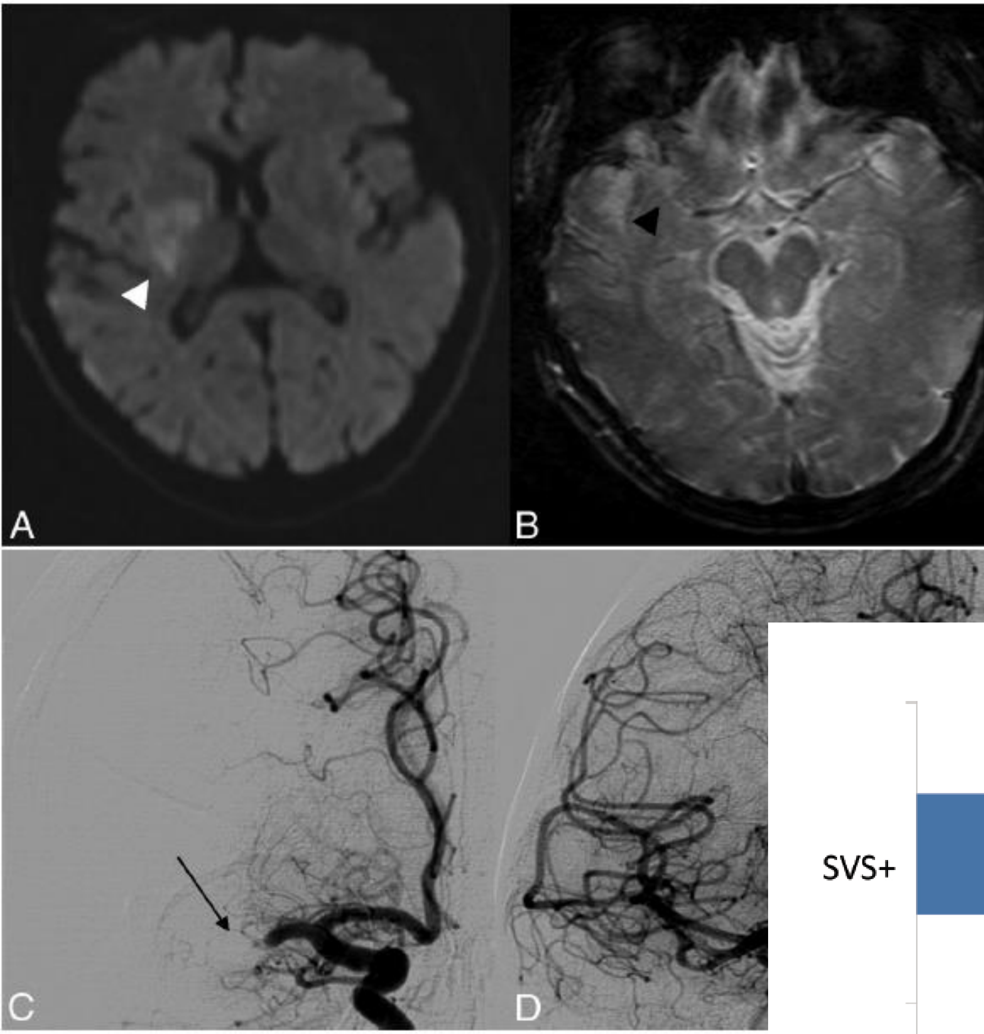
RESULTS: Thirty patients (71%) had
with MCA or ICA occlusion at MR
specificity, 100%). Mean lesion volum
a positive susceptibility sign ($P = .01$)
mean lesion volume on DW images
identified proximal to MCA division
perfusion deficit of 83.9% of the tota

CONCLUSION: Presence of the sus
provides fast and accurate detection
occlusion.

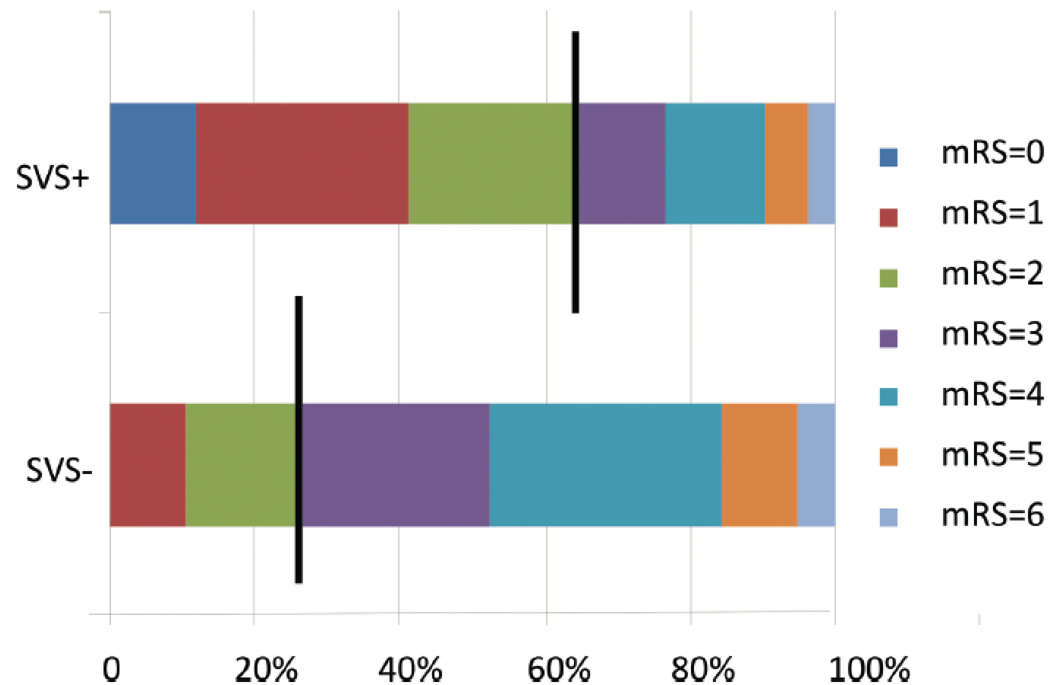




Origine
(TOAST)
Imagerie
Recanalisation
Histo



	Univariate			Multivariate		
	OR	95% CI	*P* Value	OR	95% CI	*P* Value
Age	0.9	0.9–1.01	.25	0.9	0.9–1.01	.13
Sex	1.4	0.5–3.6	.48			
Initial NIHSS (≤20 vs >20)	0.8	0.3–2.1	.66			
ASPECTS (≤7 vs >7)	0.9	0.4–2.4	.89			
Dissection	1.2	0.3–4.7	.77			
ICA occlusion	1.8	0.7–4.7	.22			
IV tPA	0.8	0.3–2.1	.69			
Onset-to-groin puncture			.58			
270 min to 6 hr vs >360 min	1.7	0.6–5.0				
≤270 min vs >360 min	1.7	0.5–5.7				
SVS+	5	1.6–16.6	.01[a]	8.7	1.1–69.4	.04[a]
Lack of spontaneous hyperattenuation on CT	3.6	1.3–9.7	.01[a]	3.6	0.7–18.9	013
Day 1 NIHSS (≤10 vs >10)	51.5	11.8–225.1	<.001[a]	51.9	8.4–320.5	<.001[a]
TICI (≥2b vs <2b)	5.1	1.4–17.9	.01[a]	7.1	0.4–112.8	.16



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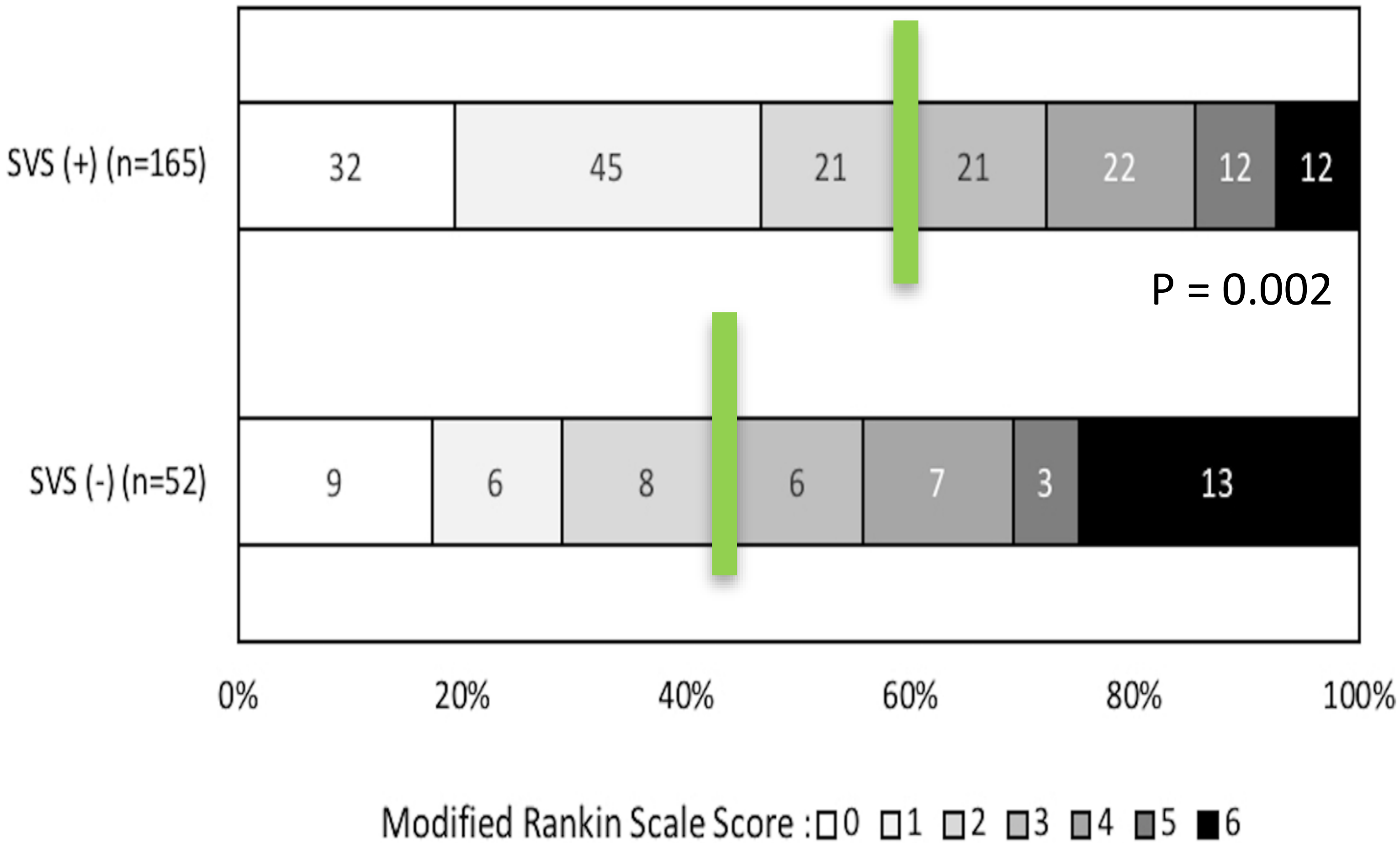
Bourcier et al . AJNR 2015

Population ASTER et THRACE traitée par SR en première ligne

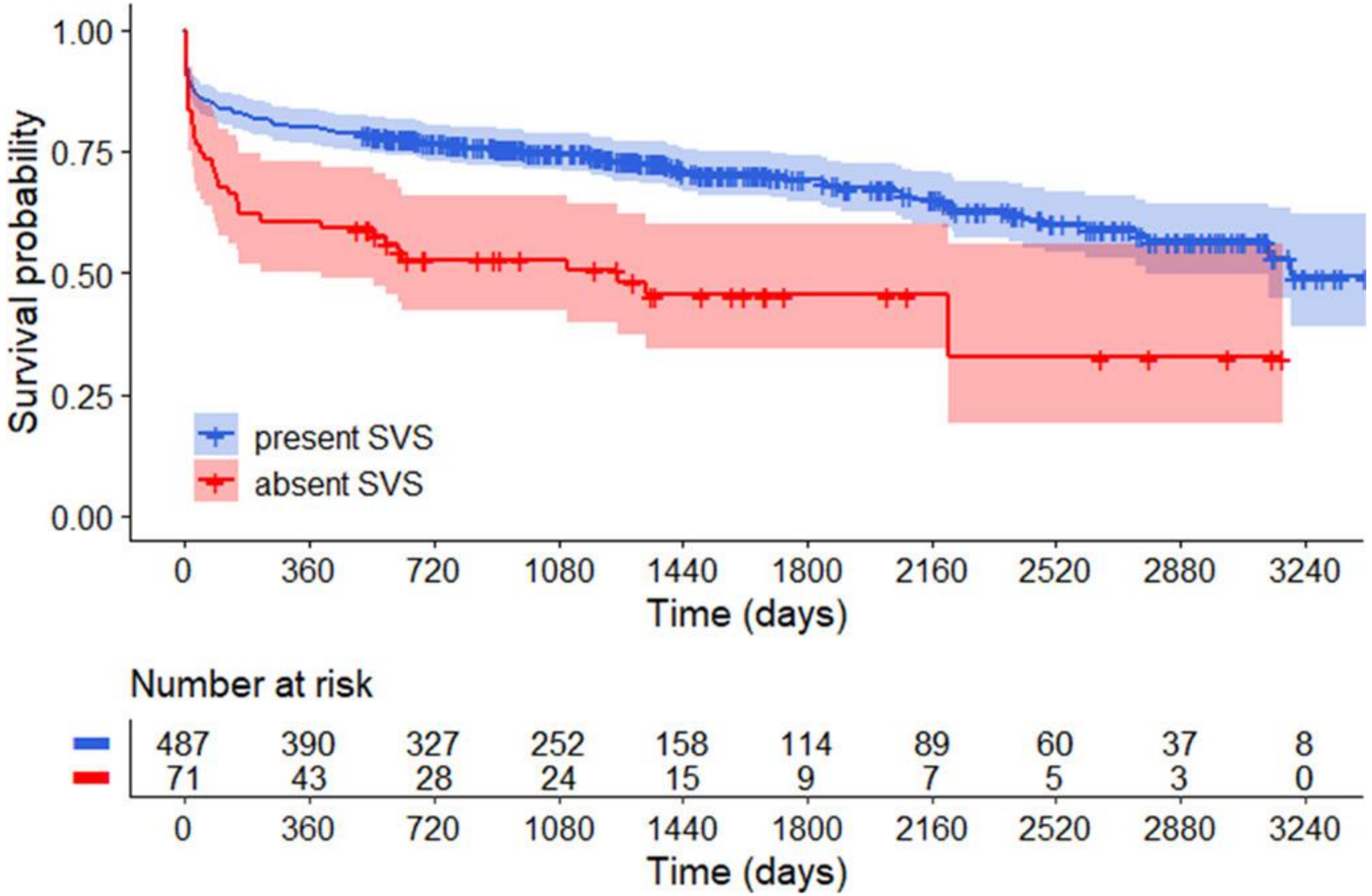


Susceptibility vessel sign on MRI predicts better clinical outcome in patients with anterior circulation acute stroke treated with stent retriever as rst- line strategy JNIS 2018

500 patients monocentrique Bern

Absence SVS poorer outcomes and higher mortality rates during long-term

After adjustment for underlying conditions and interventional parameters that are known to be associated with the absence of SVS and poor outcomes.

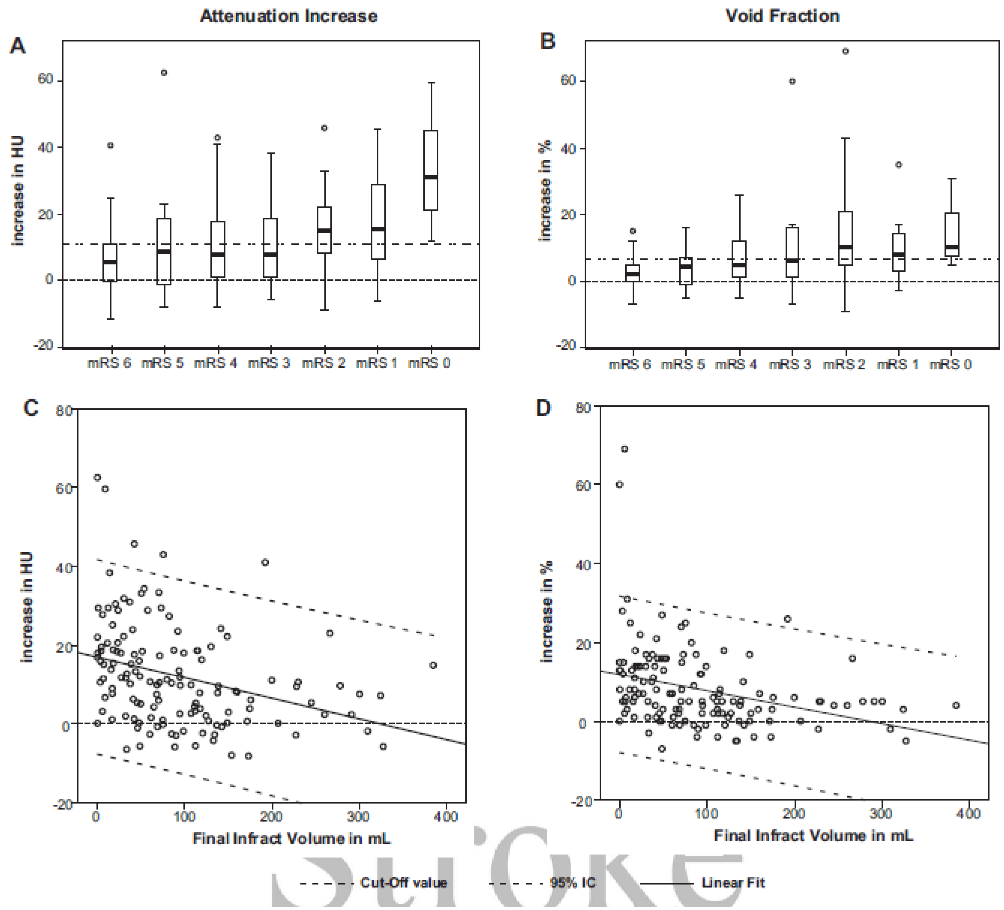


Beyeler et al. JNIS 2023

Apport du NCCT, CTA

Perméabilité du thrombus en CTA associée à :

* amélioration fonctionnelle
* meilleure recanalization
* plus petit infarctus



Santos et al. Stroke 2016

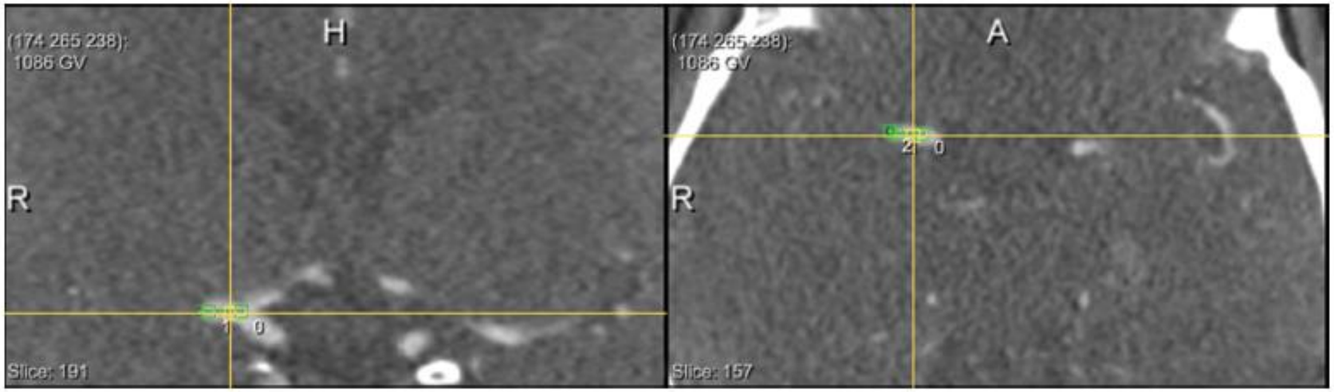


FIG 2. Distance from the ICA-T to the thrombus. Placement of seed points in the vessel from the ICA-T to the thrombus by the observer. Subsequently, the software determined the centerline through the vessel, which represents the distance from the ICA-T to the thrombus. Left: coronal view CTA. Right: axial view CTA.

Table 2: Baseline characteristics of the full MR CLEAN subgroups included in this study stratified by treatment

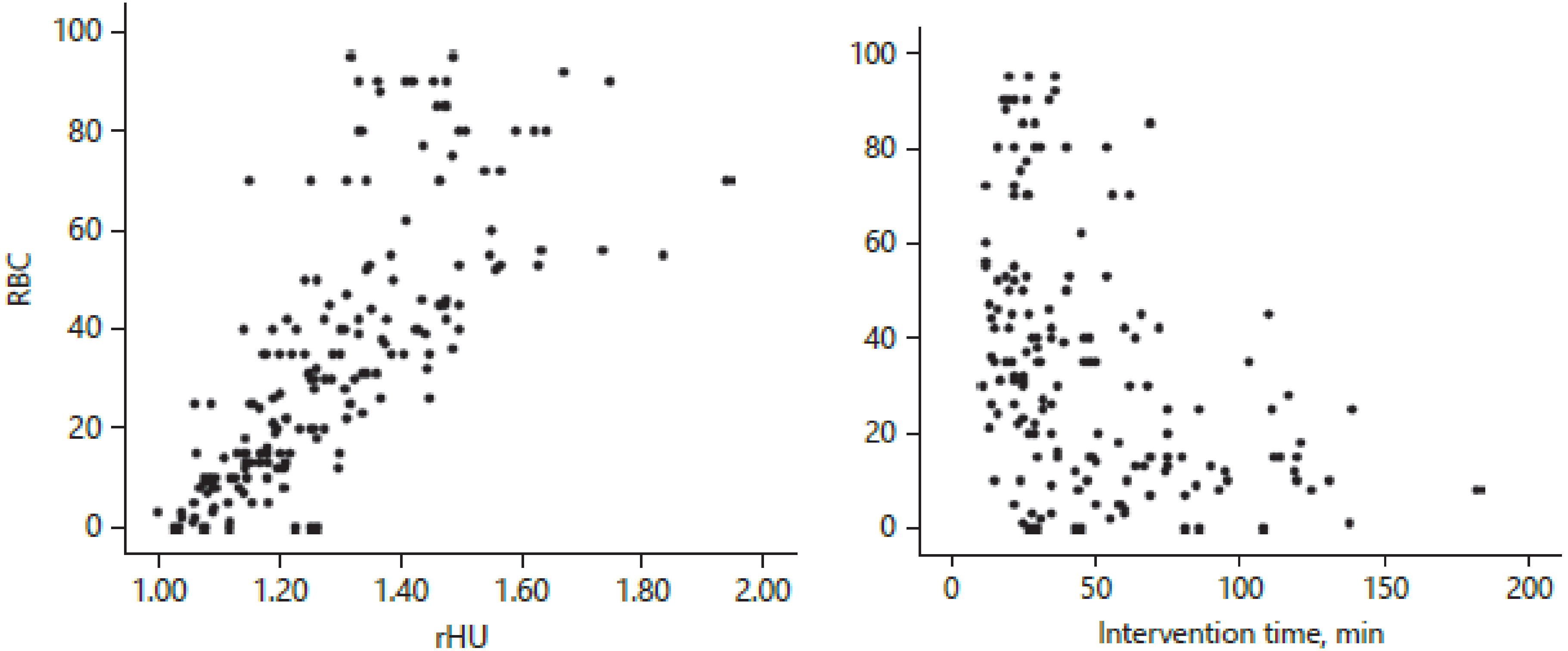
	IAT (*n* = 78)	Control (*n* = 121)
Mean age (yr)	63 (range, 43–87)	66 (range, 31–93)
Male sex (%)	67 (52/78)	56 (72/121)
Median NIHSS	17 (IQR, 13–21)	19 (IQR, 14–23)
Median ASPECTS	9 (IQR, 8–10)	9 (IQR, 8–10)
Diabetes mellitus (%)	9 (7/78)	12 (14/121)
Atrial fibrillation (%)	22 (17/78)	31 (37/121)
Previous stroke (%)	14 (11/78)	7 (9/121)
Median thrombus length (mm) (*n* = 186)	16.2 (IQR, 11.6–22.0) (range, 4.8–39.5)	15.2 (IQR, 10.3–22.3) (range, 4.8–39.5)
Median thrombus volume (mm^3) (*n* = 186)	69.3 (IQR, 51.7–111.9) (range, 6.1–329.0)	70.9 (IQR, 43.8–115.5) (range, 11.4–456.7)
Median distance to thrombus (mm)	6.8 (IQR, 0.0–12.8) (range, 0.0–38.2)	6.4 (IQR, 0.0–13.5) (range, 0.0–38.2)
T-occlusion (%)	26 (20/78)	21 (26/121)
Median density thrombus NCCT (HU)	49.0 (IQR, 45.2–55.2) (range, 33.1–67.8)	48.9 (IQR,44.1–55.4) (range, 33.1–67.8)
Median relative density thrombus NCCT (%)	137.4 (IQR, 116.0–151.4) (range, 84.8–213.0)	131.2 (IQR, 117.7–151.7) (range, 65.8–274.4)
Median density thrombus CTA (HU)	61.2 (IQR, 53.3–68.7) (range, 38.5–134.3)	61.9 (IQR, 52.5–75.1) (range, 38.5–134.3)
Median relative density thrombus CTA (%)	29.6 (IQR, 23.2–37.9) (range, 12.2–94.7)	29.8 (IQR, 20.5–43.9) (range, 12.5–88.7)
Median thrombus attenuation increase (HU)	12.3 (IQR, 0.74–19.6) (range, −9.9–80.0)	11.2 (IQR, −0.9–28.5) (range, −9.9–80.0)
Median thrombus void fraction (%)	5.8 (IQR, 0.99–12.3) (range, −8.9–61.8)	6.1 (IQR, −0.47–16.8) (range, −8.9–61.8)

Longeur>18mm et perméabilité du thrombus lié au mRS en univarié.

Densité relative du thrombus = facteur indépendant associé OR 1.21 per 10% (95% CI, 1.02–1.43; P".029).

Pas de modification du “TTT-effect” en lien avec les caractéristiques du thrombus

Borst et al. AJNR 2017



168 patients (93,4%) recanalisation complète

association entre moins de fibrine ($p < 0{,}001$), plus de GR ($p < 0{,}001$) et Hyperdensité au CT ($p < 0{,}001$)

Durées d'intervention plus longues ($p \leq 0{,}001$) quand GR diminue ($p \leq 0.001$).

Sporns et al. Cerebrovasc Dis 2017

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- A comparé, un traitement de première ligne par :

  * contact aspiration (CA)

  versus

  * stent retriever (SR).

Pas de différence en terme de reperfusion .

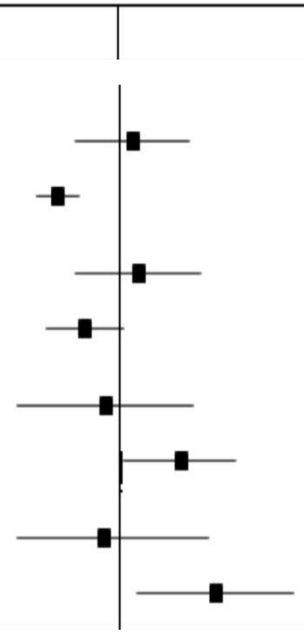
Mais, si on considère le thrombus?

Lapergue B et al. The ASTER Randomized Clinical Trial. JAMA. 2017 Aug

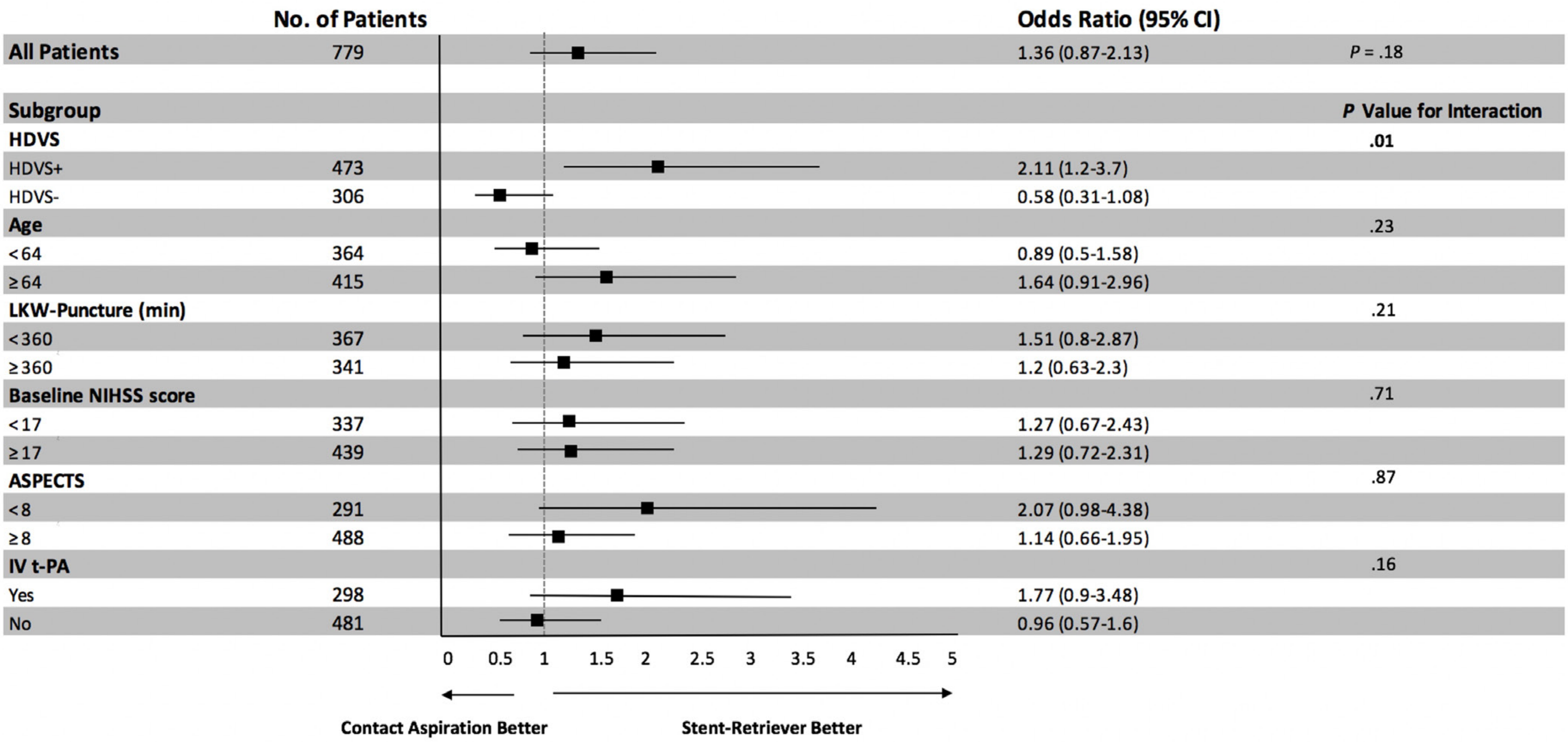
ASTER 1

Résultats angiographiques selon le SVS dans chaque bras

Angiographic outcomes	SVS	First-line SR (n=106)	First-line CA (n=96)	RR (95%CI)	*P*	*P* Het
After first-line strategy						
mTICI 2c/3	-	15/31 (48.4)	15/28 (53.6)	1.11 (0.69 to 1.77)	0.66	0.018
	+	44/75 (58.7)	24/68 (35.3)	0.60 (0.50 to 0.71)	<0.001	
mTICI 2b/3	-	20/31 (64.5)	21/28 (75.0)	1.16 (0.69 to 1.93)	0.57	0.018
	+	56/75 (74.7)	38/68 (55.9)	0.75 (0.54 to 1.03)	0.078	
Number of passes>2	-	12/31 (38.7)	10/28 (35.7)	0.89 (0.43 to 1.81)	0.24	0.032
	+	25/75 (33.3)	36/68 (52.9)	1.61 (1.01 to 2.55)	0.045	
Use of rescue treatment	-	11/31 (35.5)	9/28 (32.1)	0.88 (0.38 to 2.05)	0.77	0.031
	+	13/75 (17.3)	25/68 (36.8)	2.19 (1.15 to 4.14)	0.017	



*Bourcier et al . **Journal of Stroke 2018***

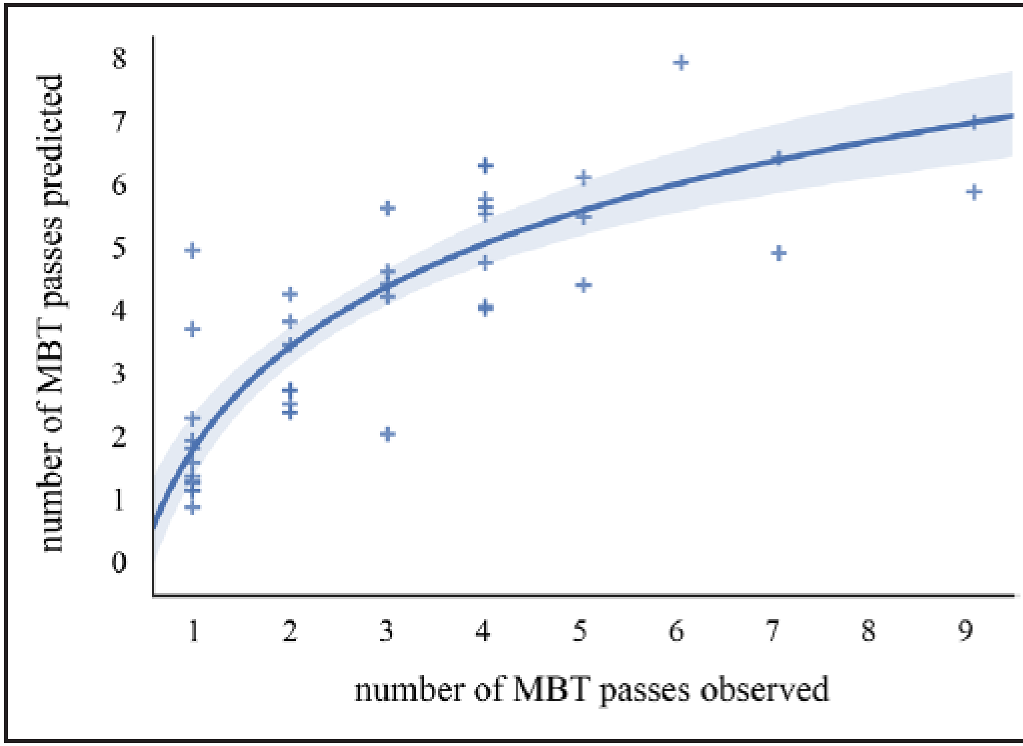


HDVS et FPE dans 473 (60,7%) et 286 (36,7 %) patients, respectivement.
HDVS modifie l'effet de la thrombectomie sur FPE (p=0,01) qd HDVS
non-HDVS ayant une meilleure réponse à CA

Mahmoud H Mohammaden et al. JNIS 2020

Table 1. Radiomics Features and Filters

Radiomics Features Class	No. of RFs
First-order statistics	18
Shape based	13
Gray level co-occurrence matrix	23
Gray level run length matrix	16
Gray level size zone matrix	16
Neighboring gray tone difference matrix	5
Gray level dependence matrix	14
Image filters	
Laplacian of gaussian (sigma: 0.5, 1.0, 2.0)	276
Wavelet	736
Square	92
Square root	92
Logarithm	92
Exponential	92



une cohorte de formation (n=109) et cohorte de validation prospective (n=47).

Thrombi segmentés sur CT et calcul automatique de 1485 caractéristiques radiomiques

2 modèles d'apprentissage développés sur la cohorte de formation pour prédire FPE thromboaspiration et Nb passages

9 caractéristiques radiomiques prédisent FPE - CA

Jeremy Hofmeister et al. Stroke 2020

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Séquence de quantification

- SVS parfois difficile à déterminer - qualitatif
- Nécessité d’un outil fiable - quantitatif
- Nécessité de séquence courte dans le cadre du stroke

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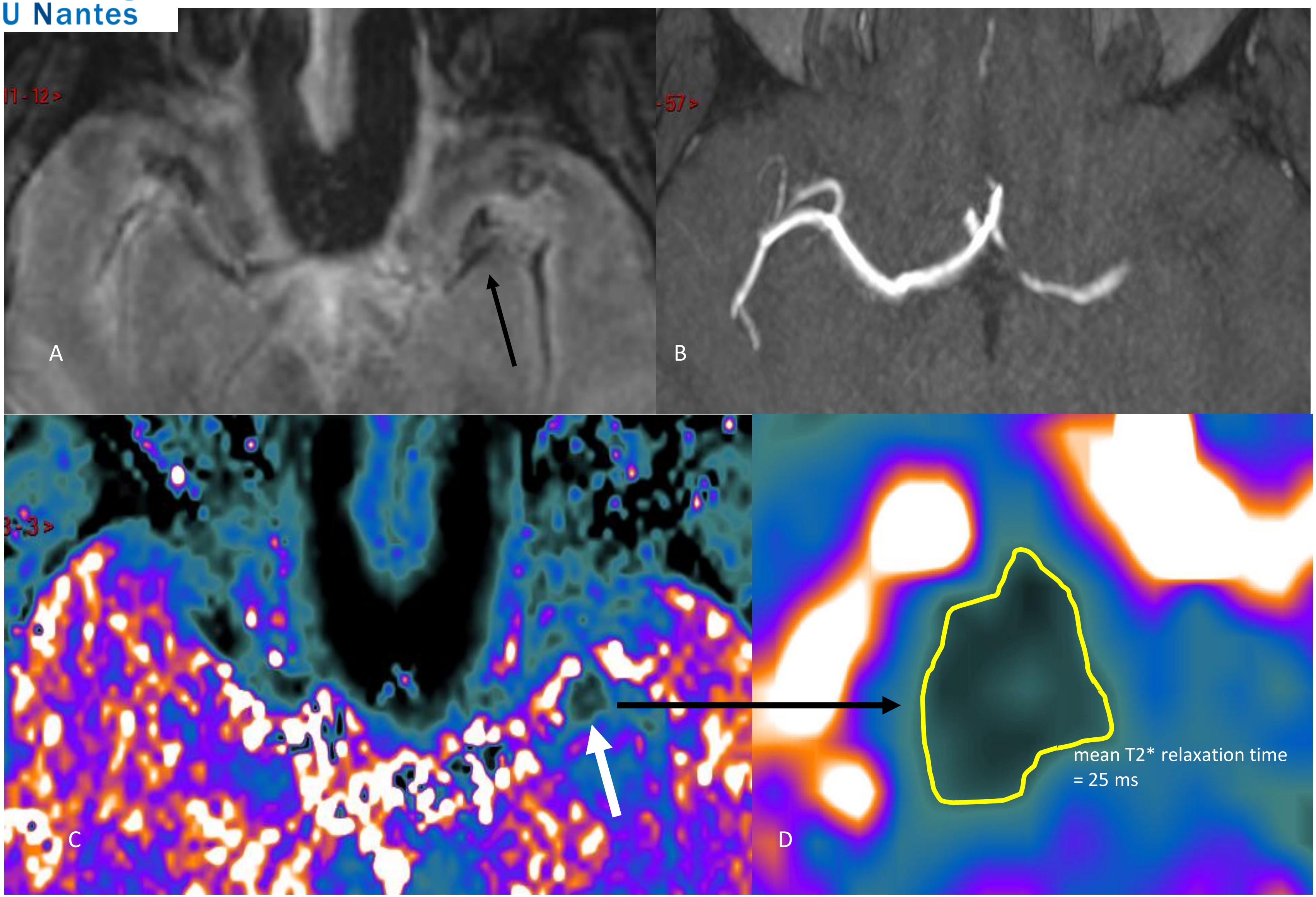
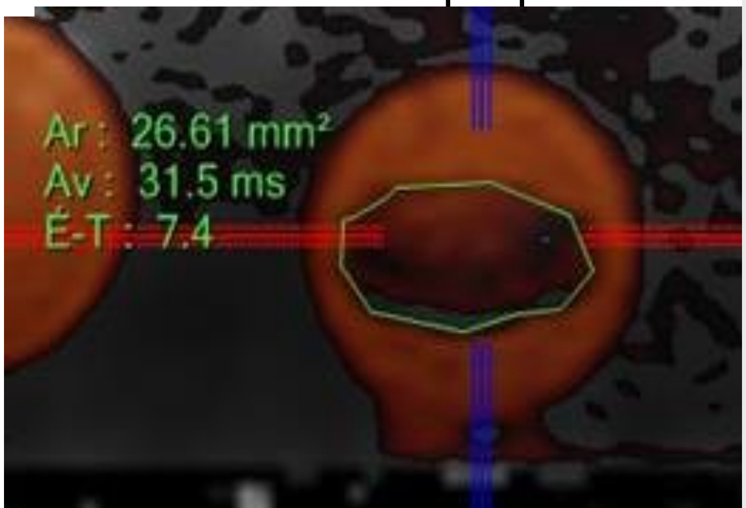
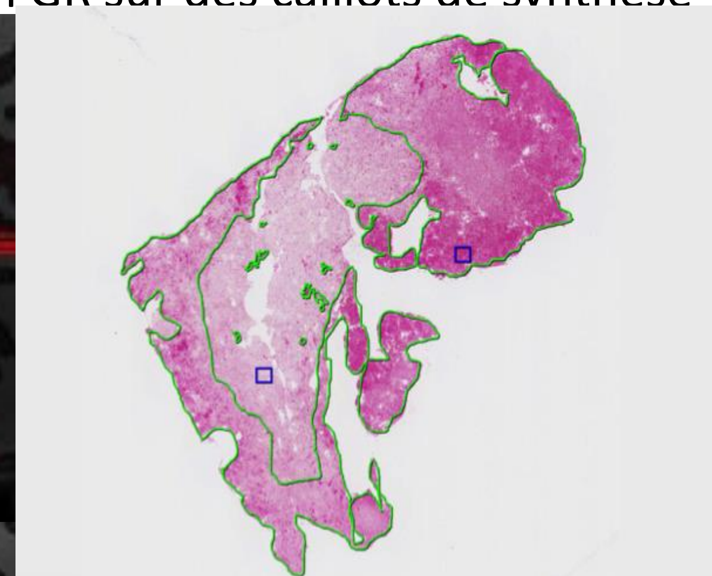
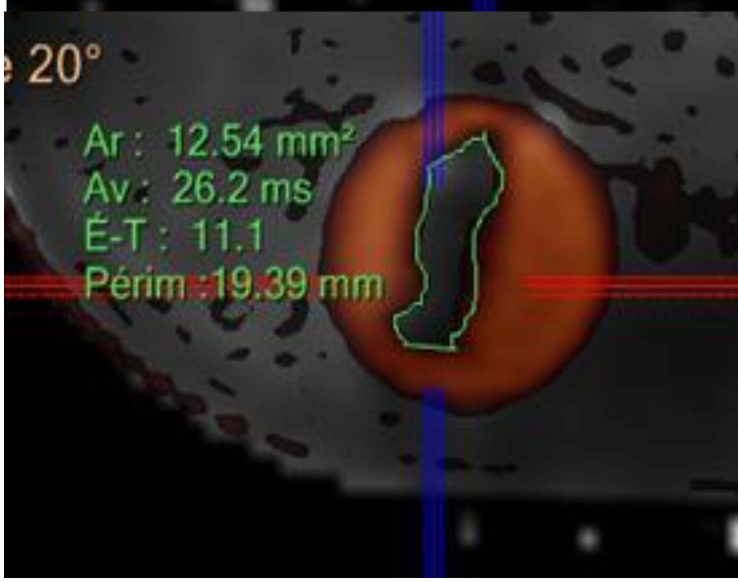
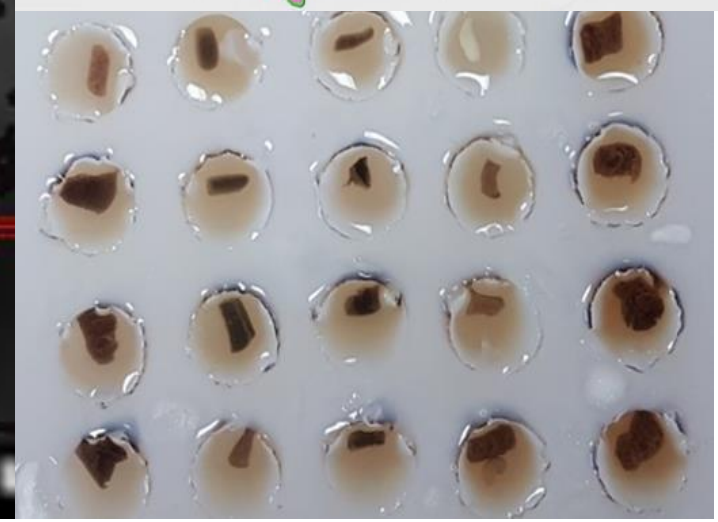


TT2*RT et proportion en GR sur des caillots de synthèse





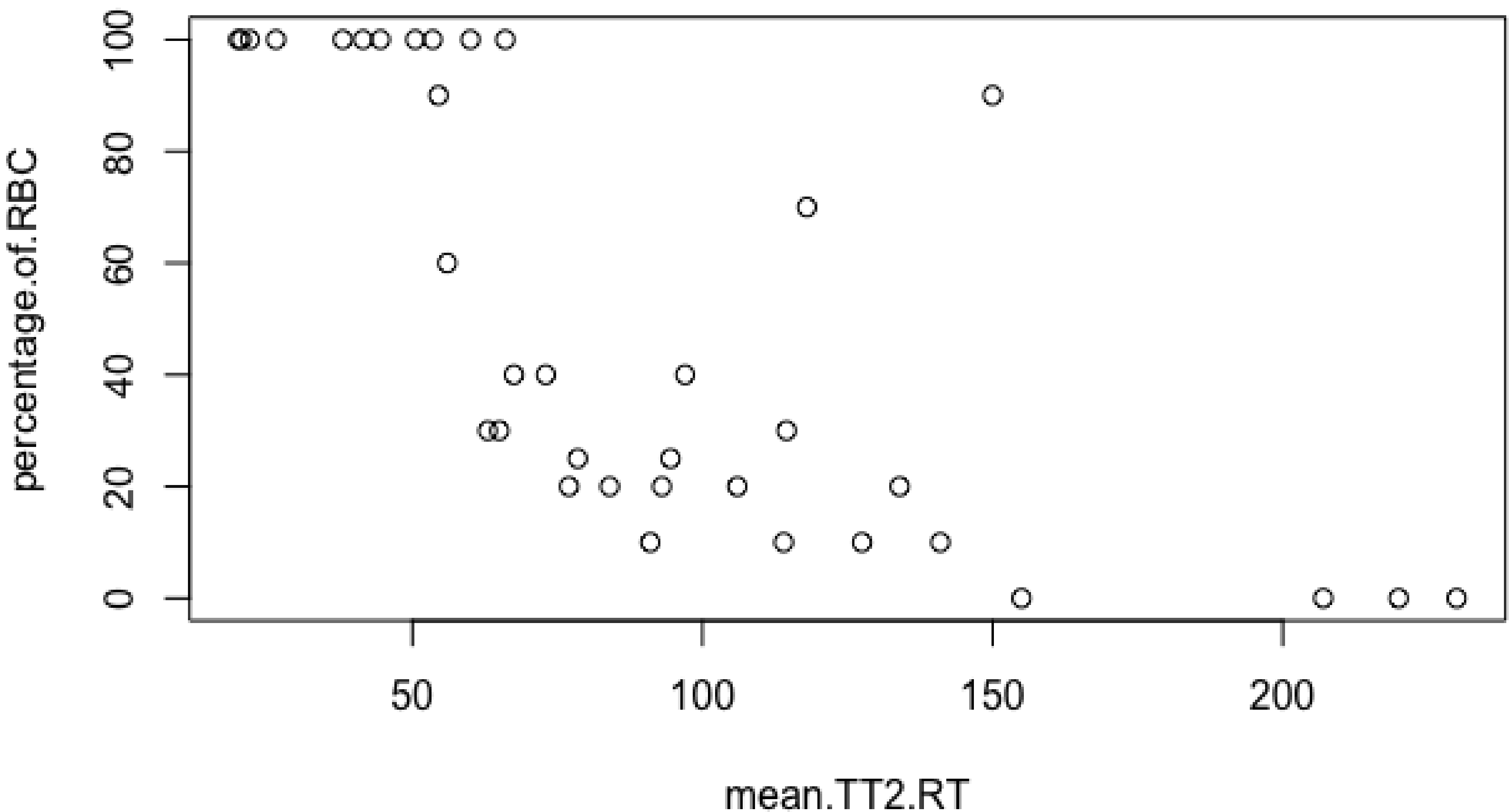




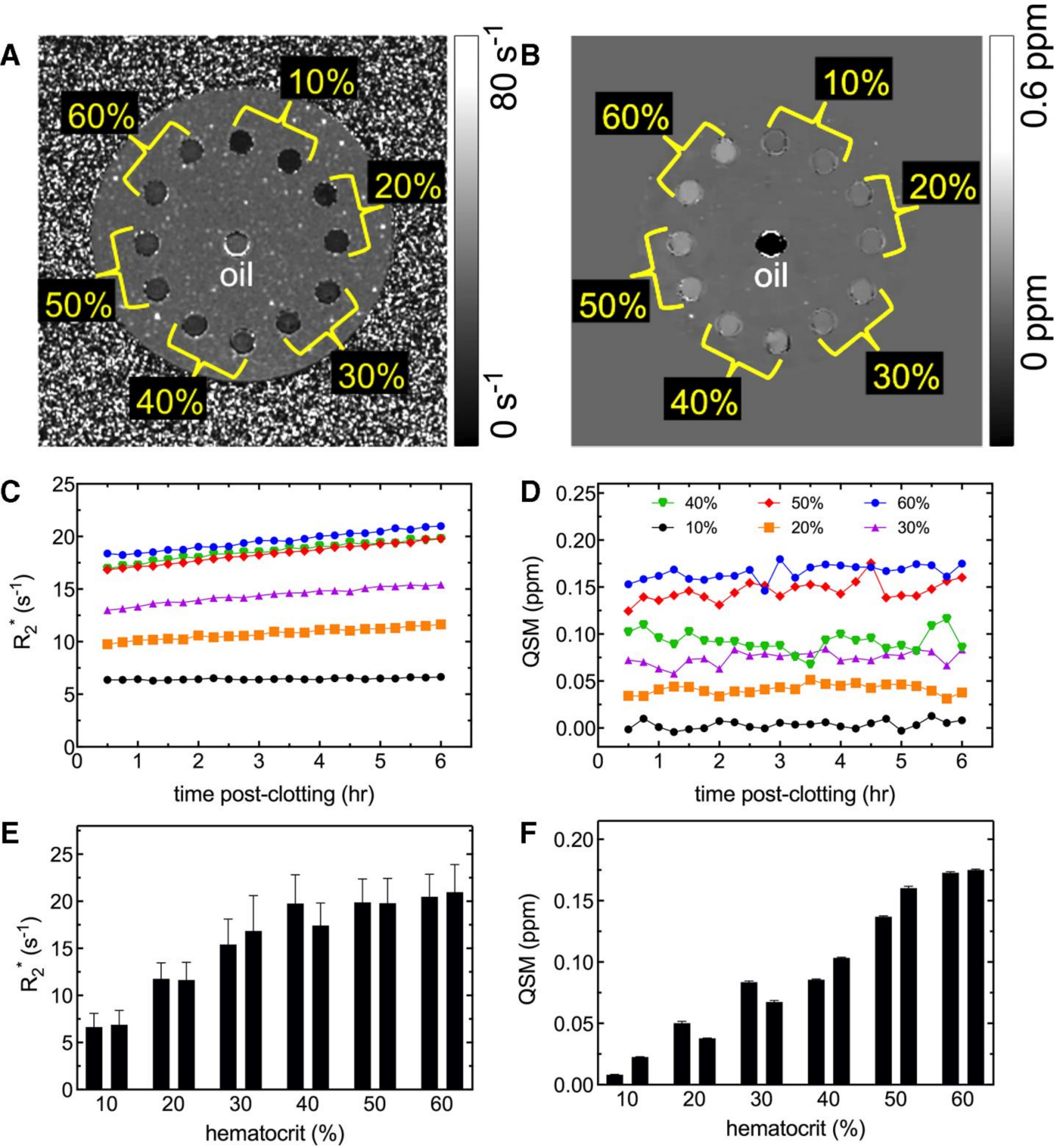
Bourcier et al . AJNR 2018

Correlation entre TT2*RT et proportion en GR

ρ: -0.84, p-value < 0.0001



Bourcier et al . AJNR 2018



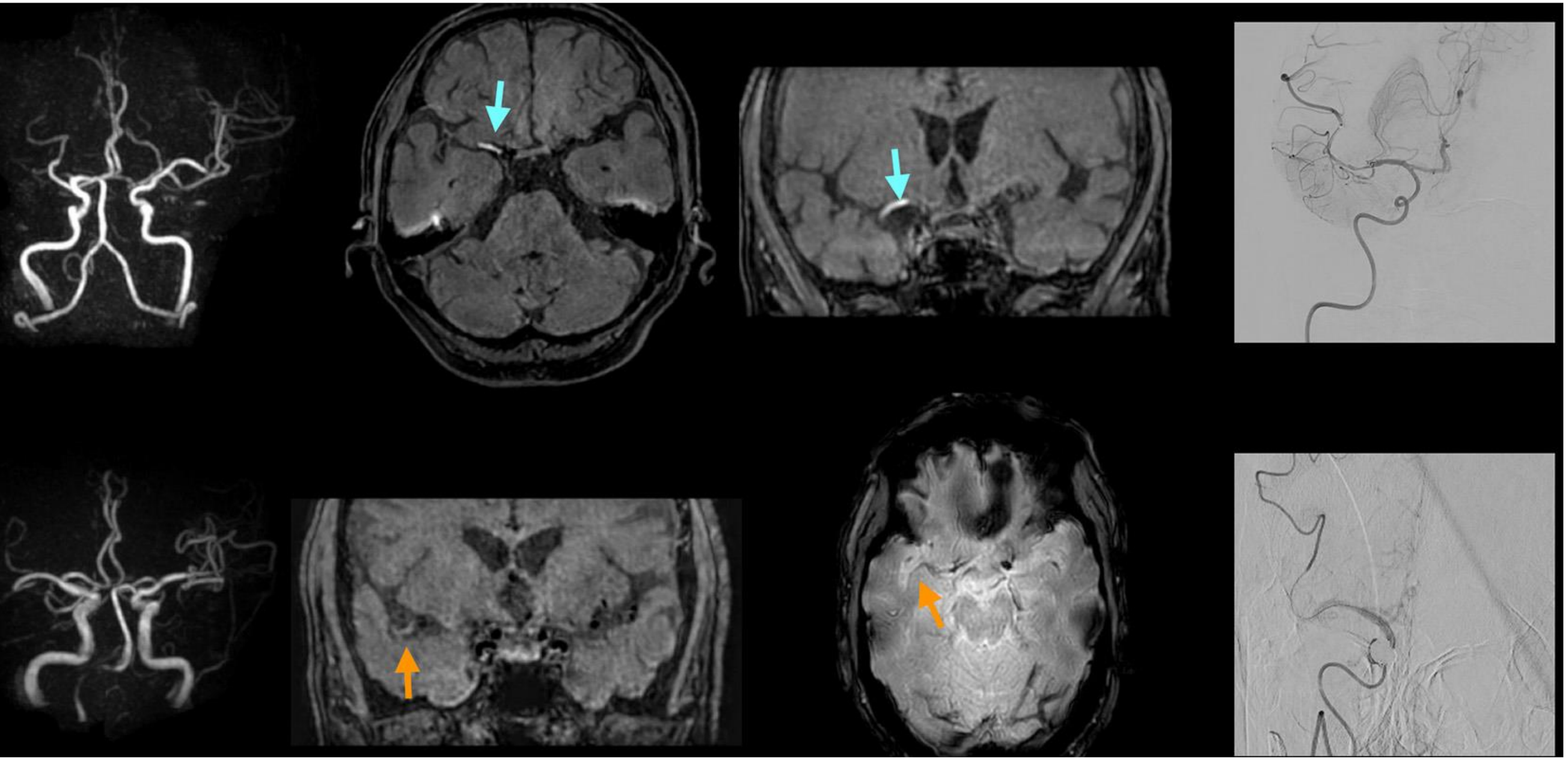
2 caillots scannés à 6 jours d’intervalle

R2* et les QSM varient peu au cours des premières 6h la

QSM linéairement corrélé à l'hématocrite

Au-delà de 6 heures R2* et le QSM augmenté au fil du temps et l'hématocrite pourrait être estimé à partir de la R2*/QSMratio.

Spencer D Christiansen et al. JNIS 2019

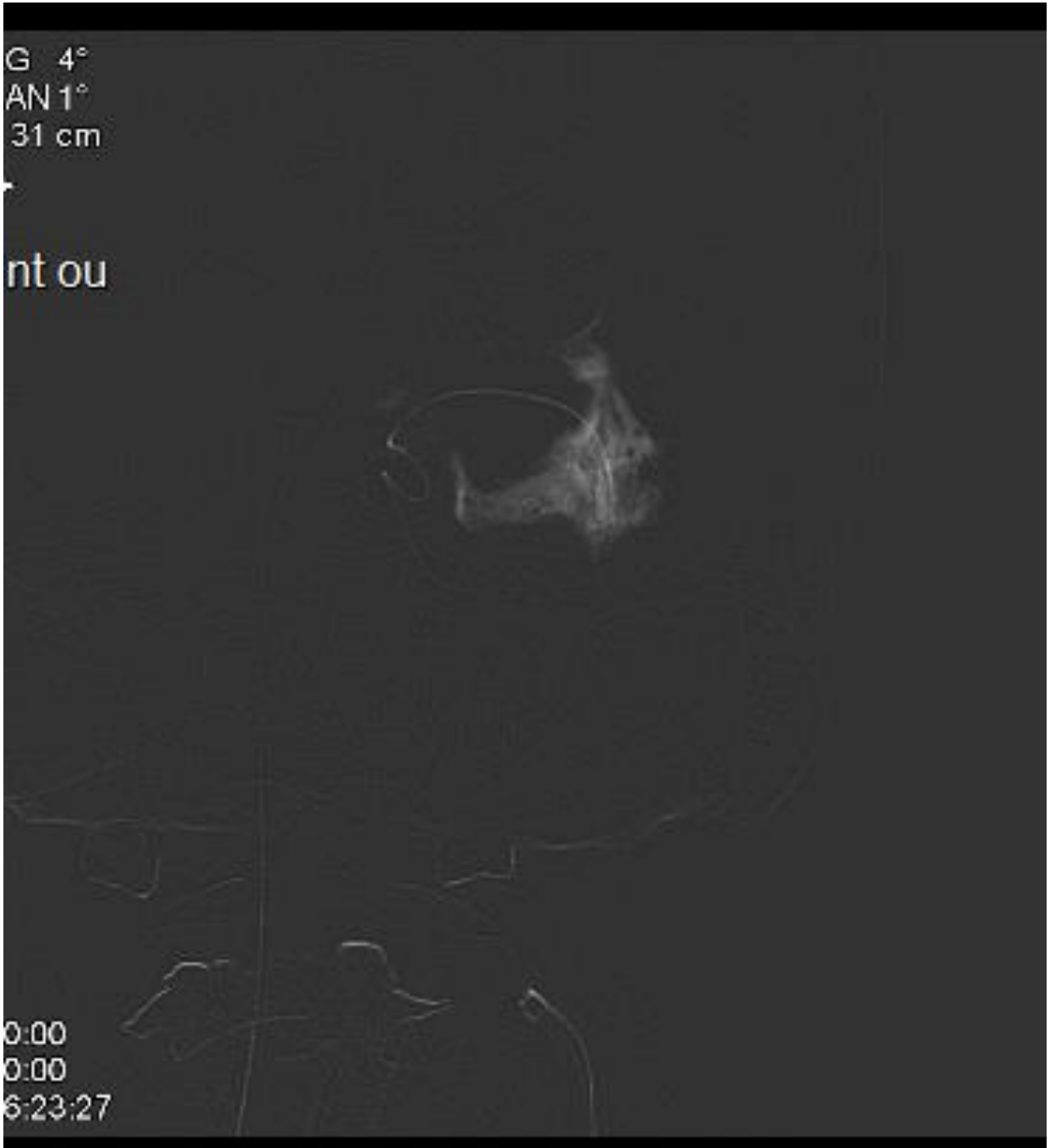


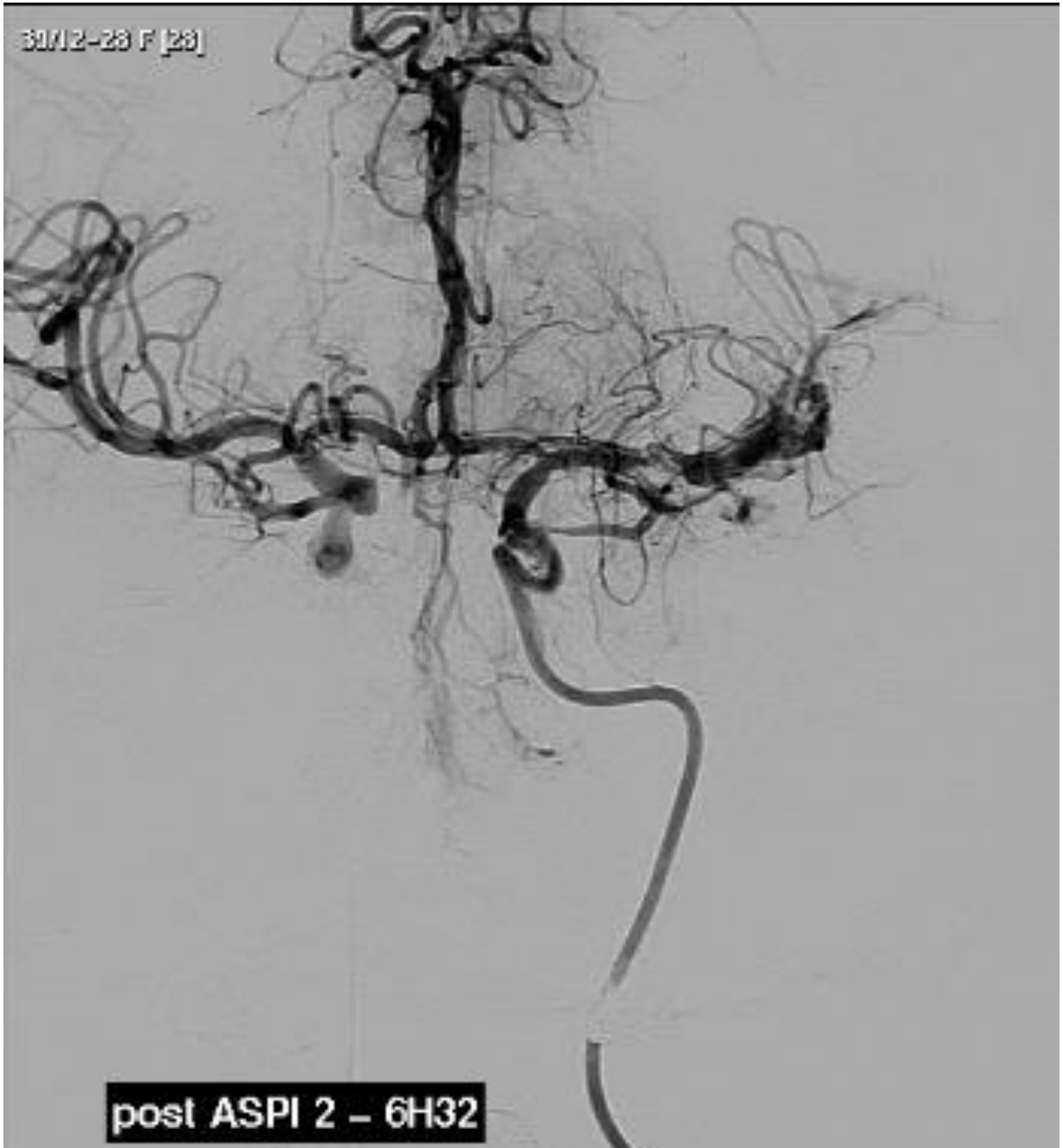
BB imaging crée à partir de la soustraction d’un TOF et d’un CP de moins de 1 min

Oura et al. Magn. Res. Imaging 2022

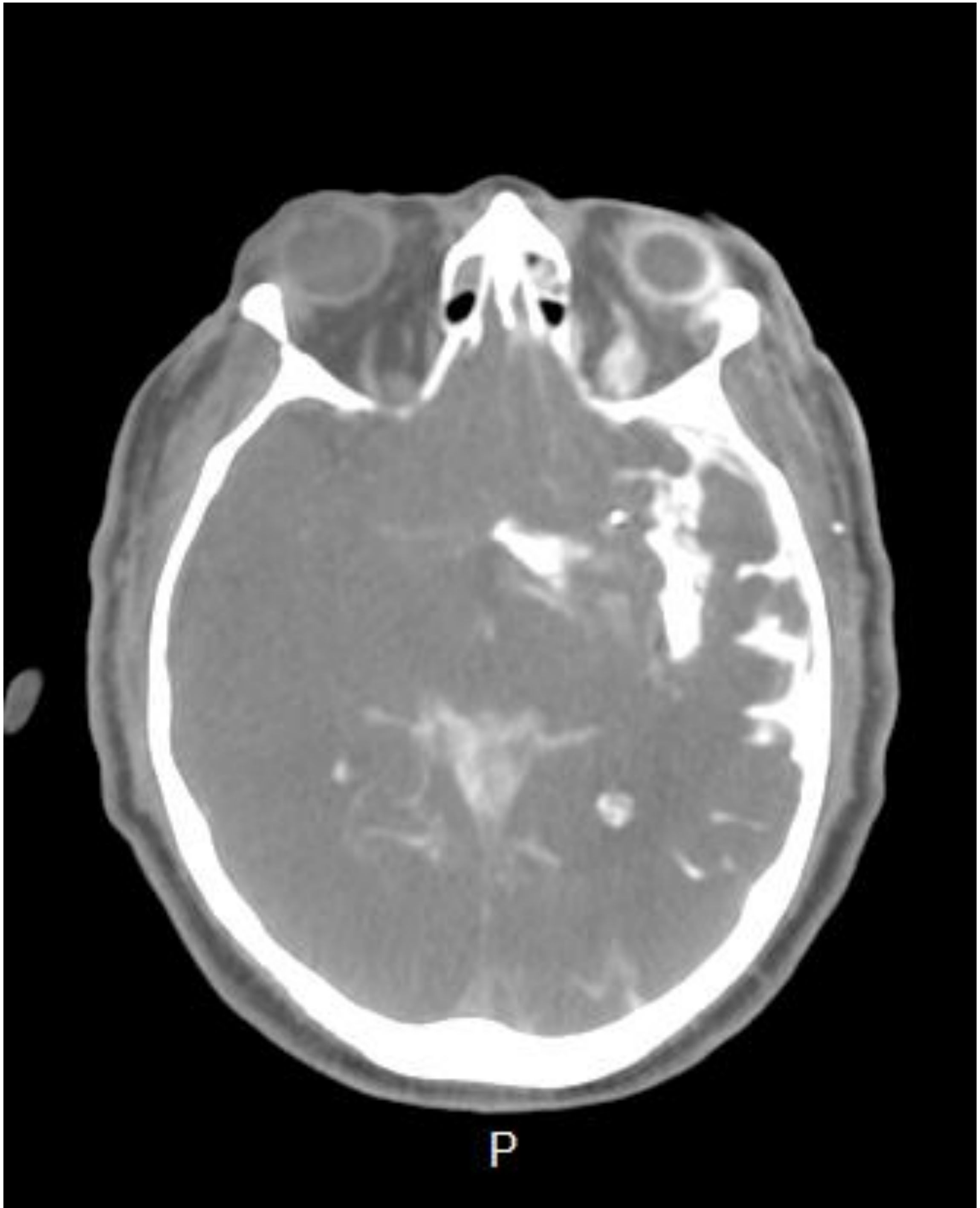

6H22


6H22


G 4°
AN 1°
31 cm
nt ou
0:00
0:00
6:23:27

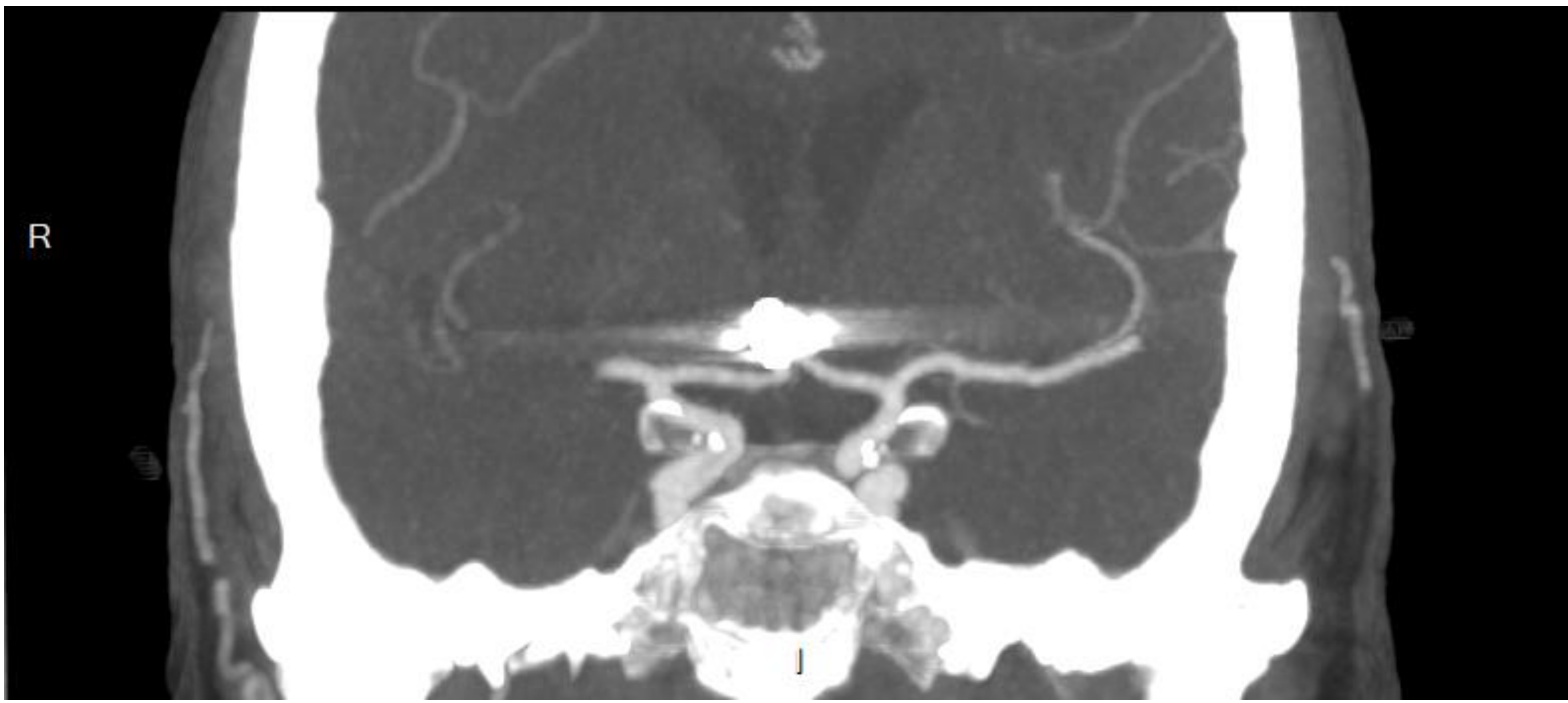

post ASPI 2 – 6H32

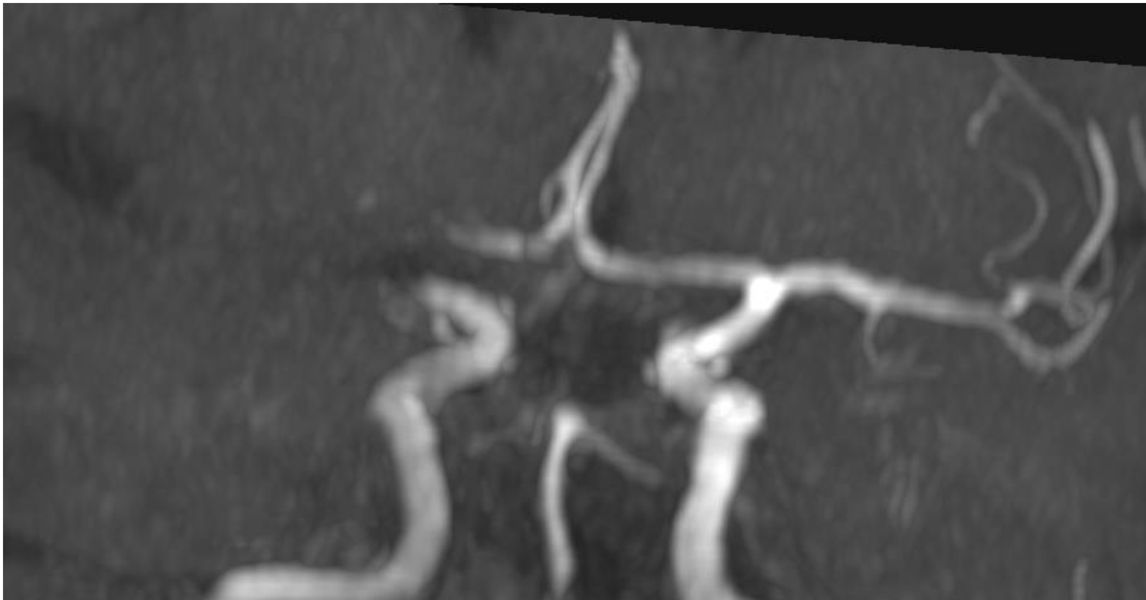

3 SPIRES – 6H41


P

Et derrière l’occlusion…

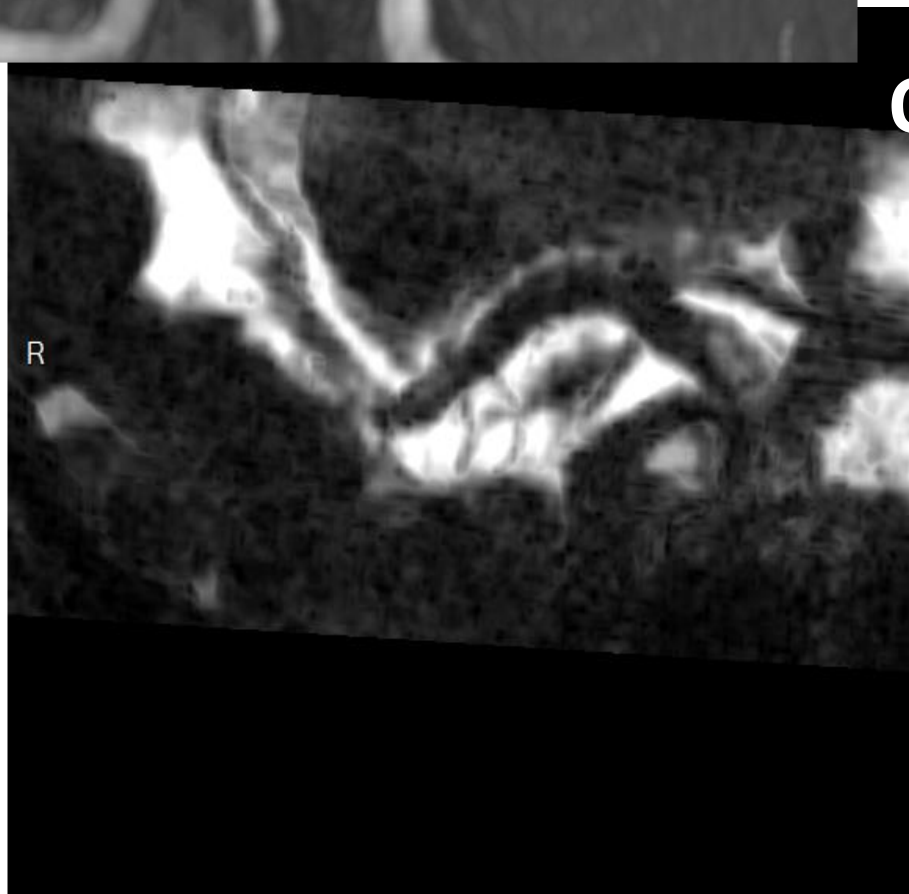
Le patient d’après … occlusion de M1 et …
ATCD d’AIC Acom
fréquence des AIC multiples ?

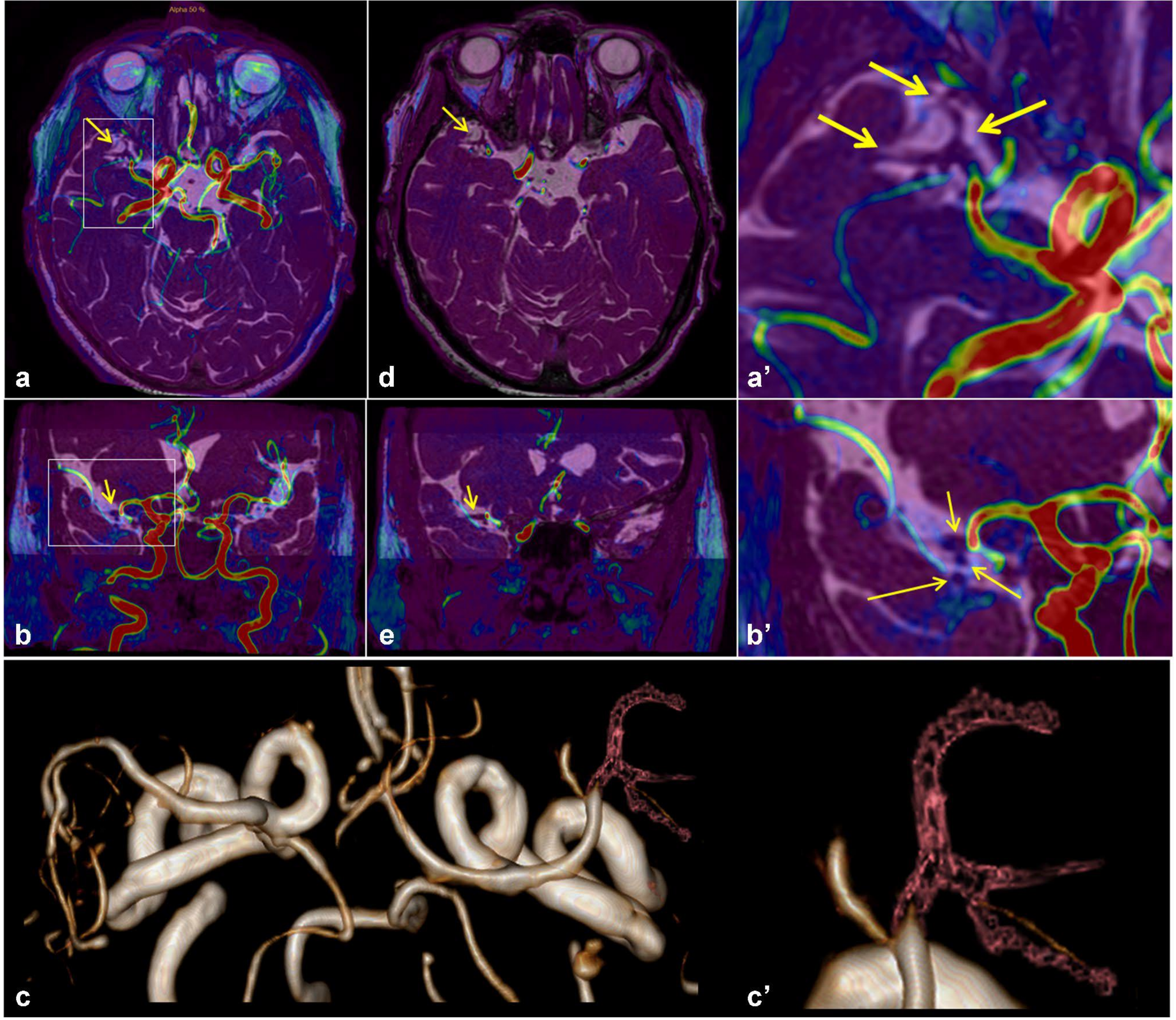




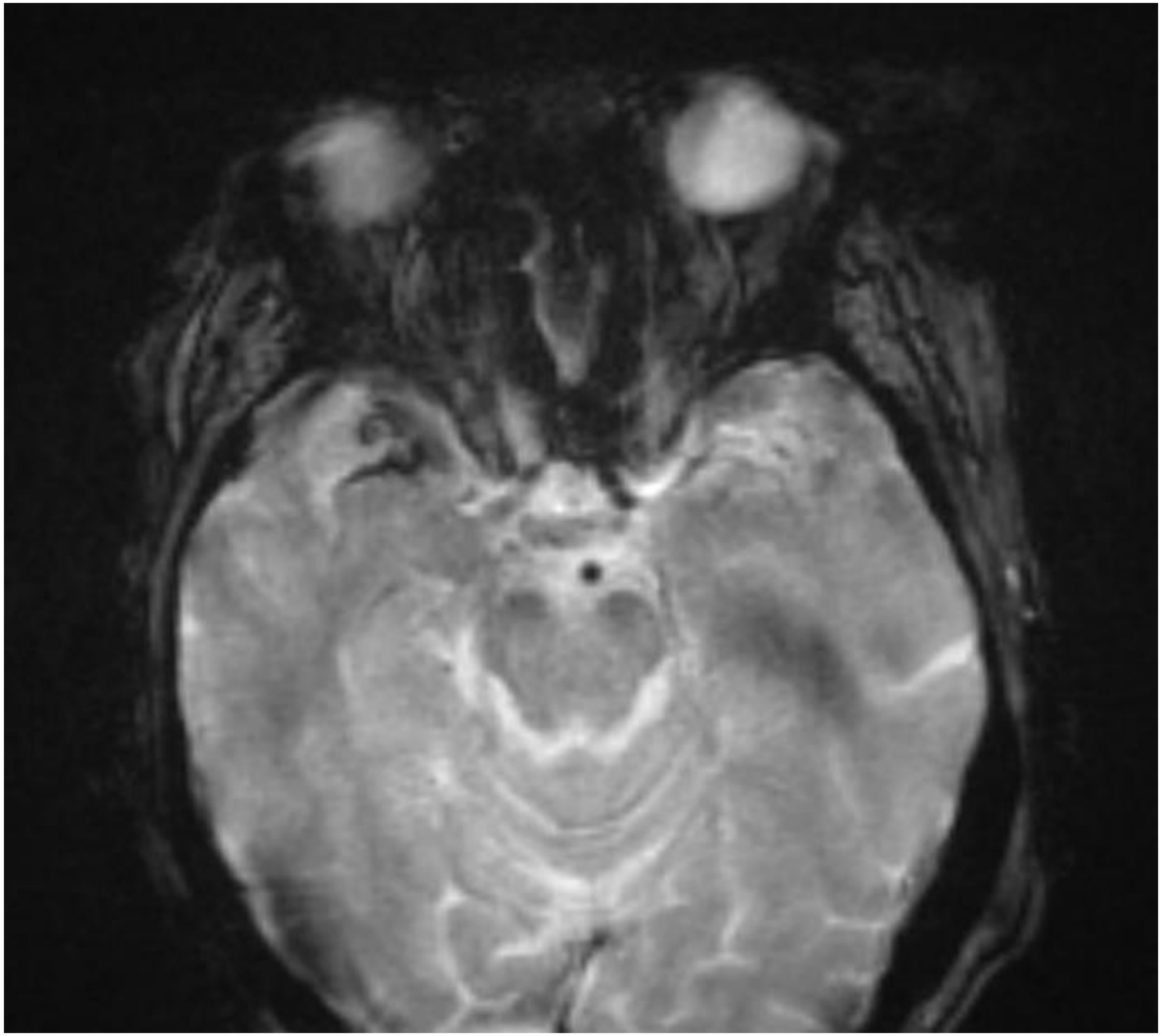
IRM préop

Ou va l'artère ?

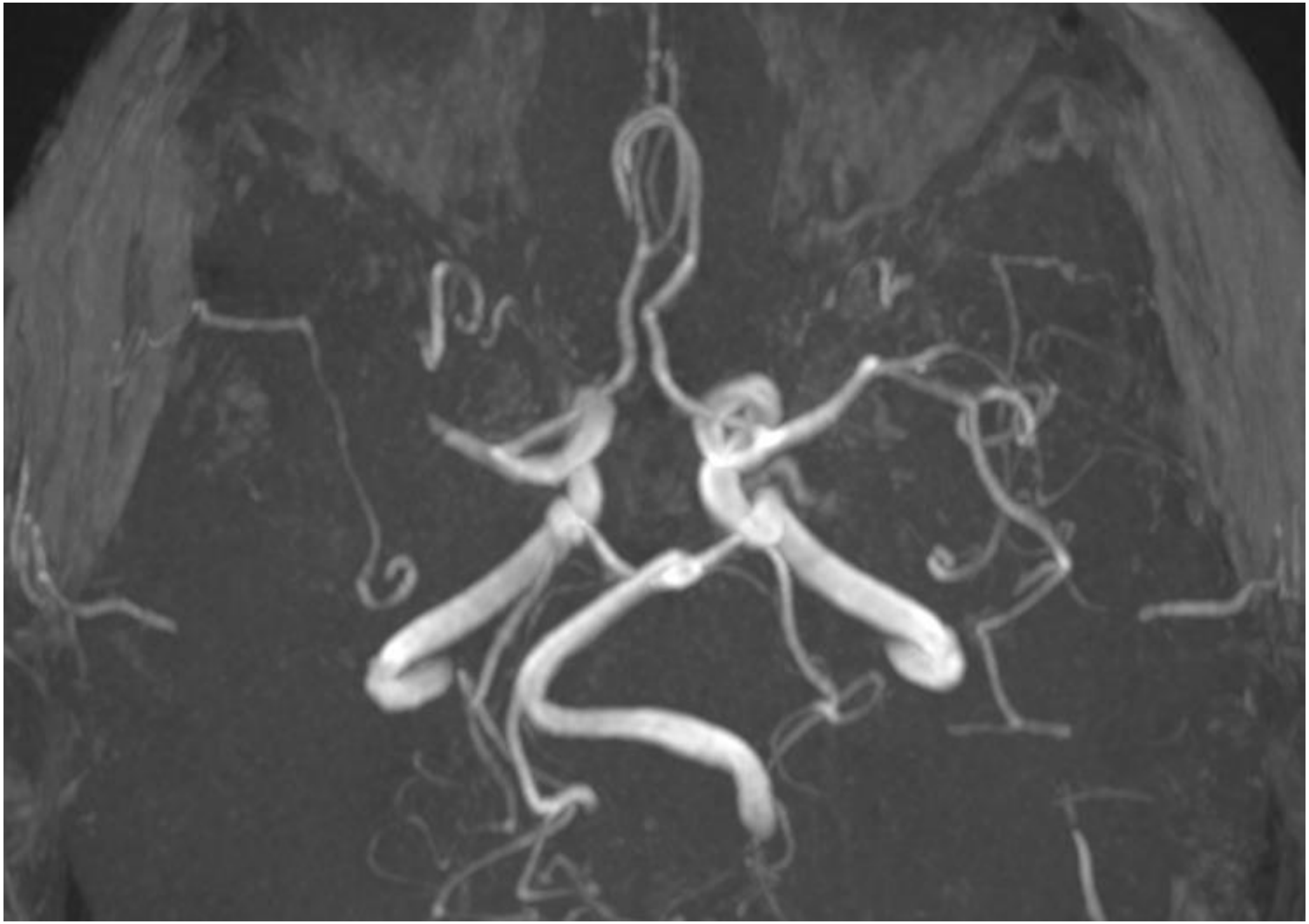




Mormina et al . Neuroradiology 2020



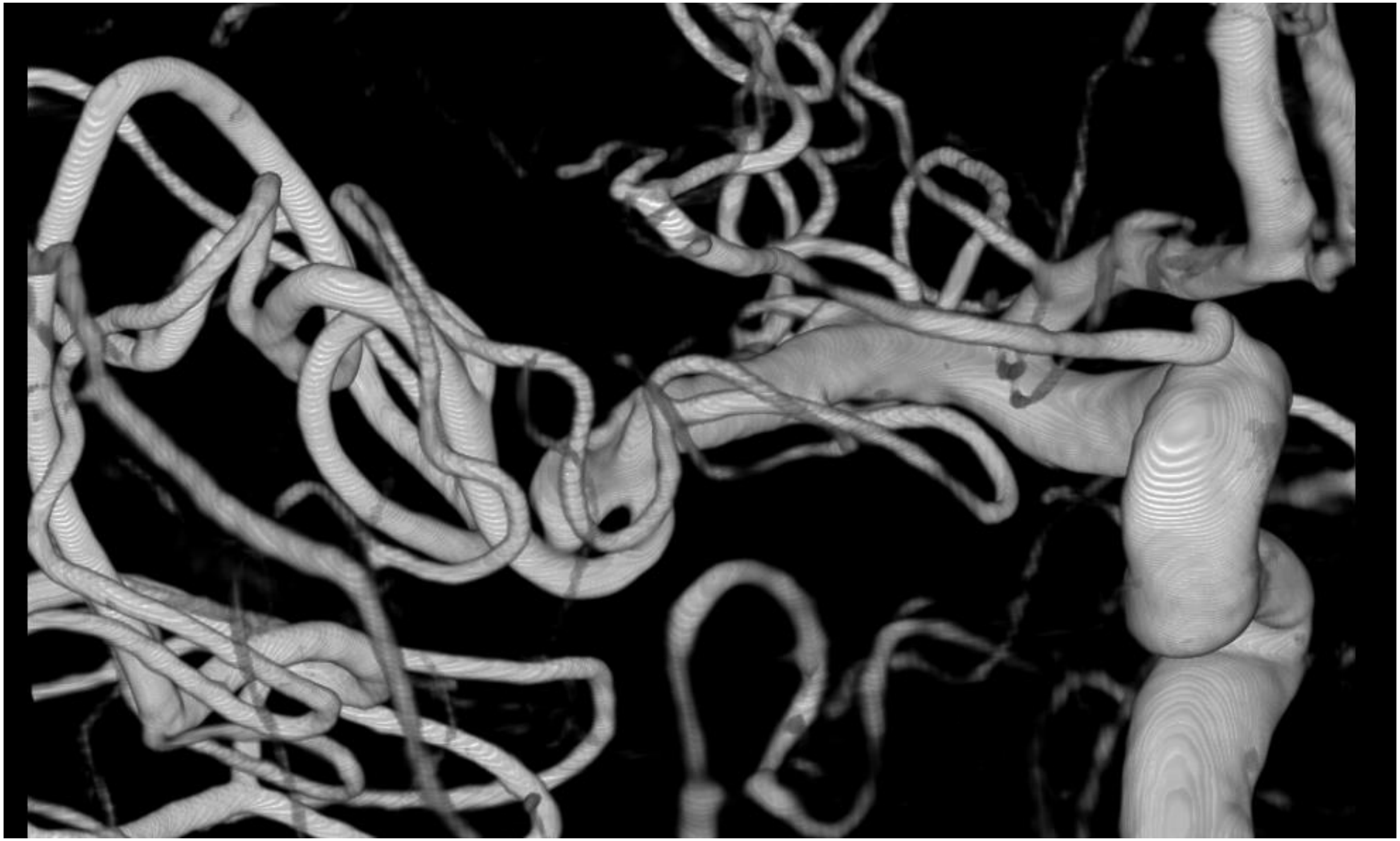
Déficit hémicorporel gauche complet chez une patiente sous Eliquis

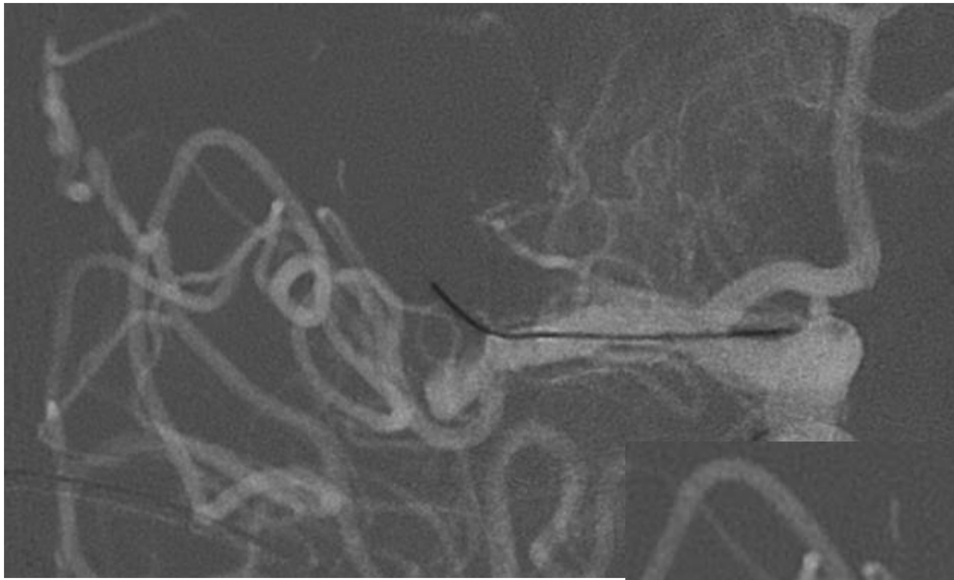


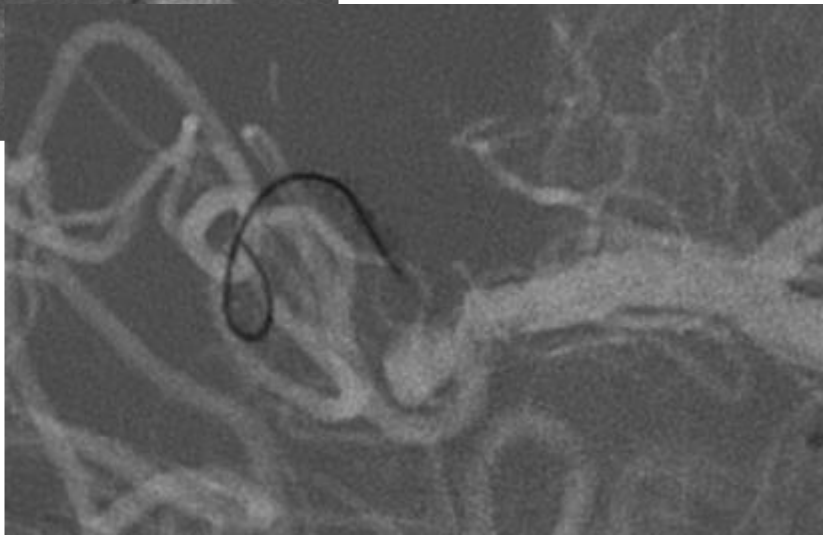

23h08 CID serie initiale
VECTOR ASPI SEULE
Merci 9f

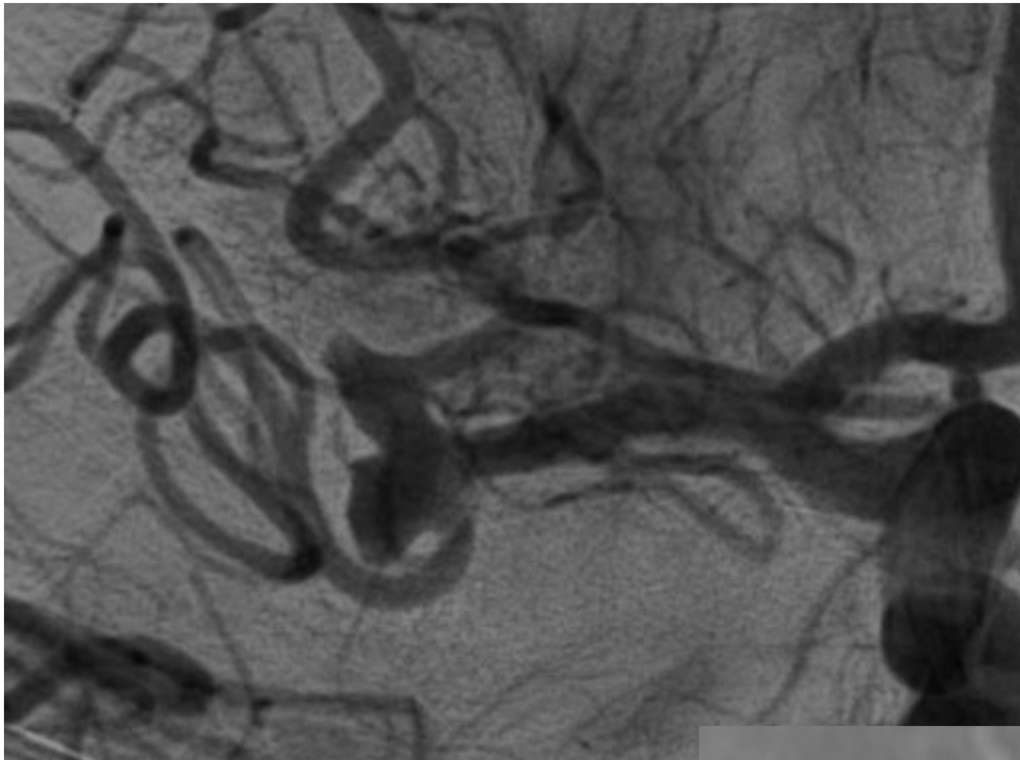
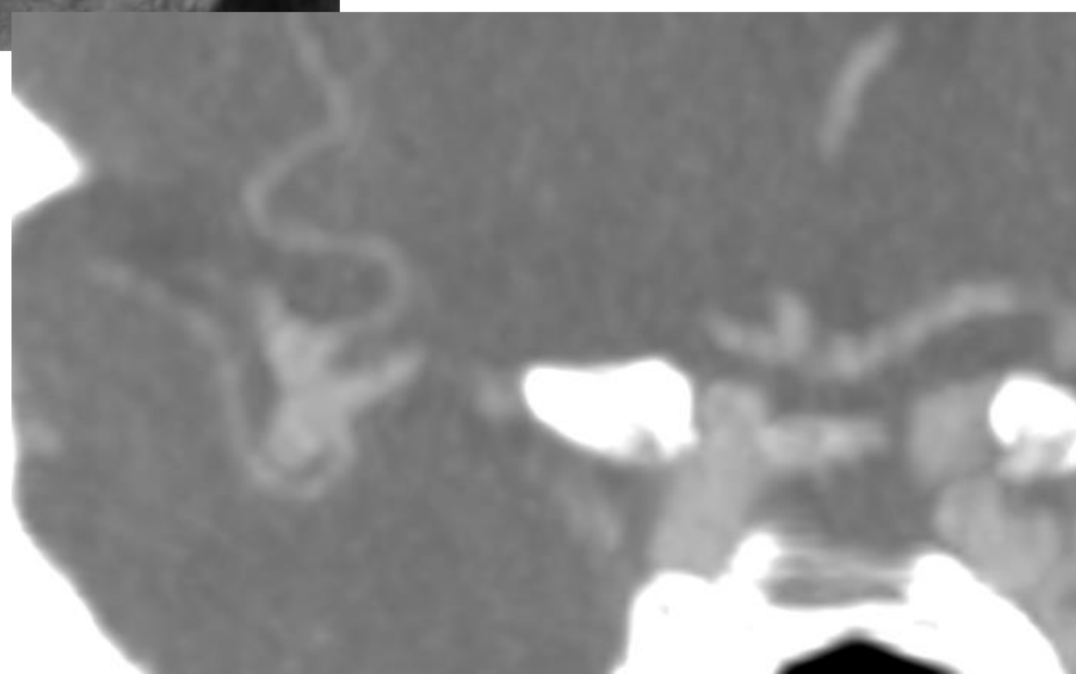

23h19 Controle post passage 1 aspi seule

Conversion en AG

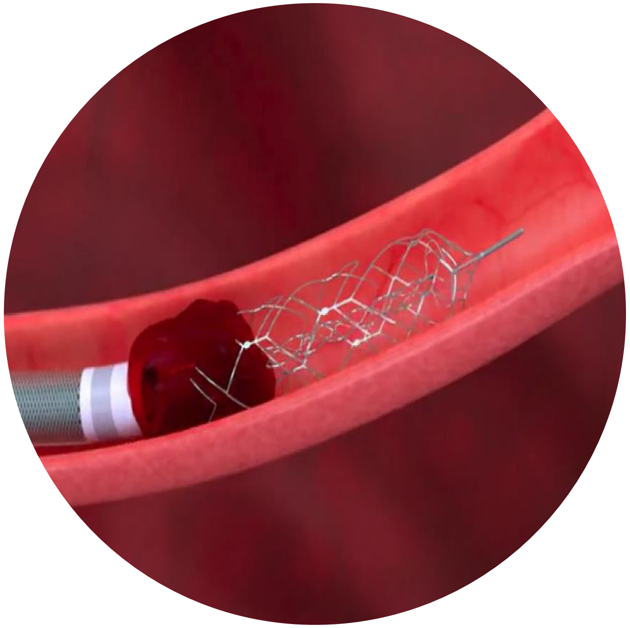






Devons nous adapter le TTT au type d'occlusion?



COMBINED TECHNIQUE si SVS +

VECTOR

adaptatiVe Endovascular strategy to the CloT MRI in large intracranial vessel Occlusion

Multicenter, prospective, randomized, open-label study with blinded evaluation (PROBE).

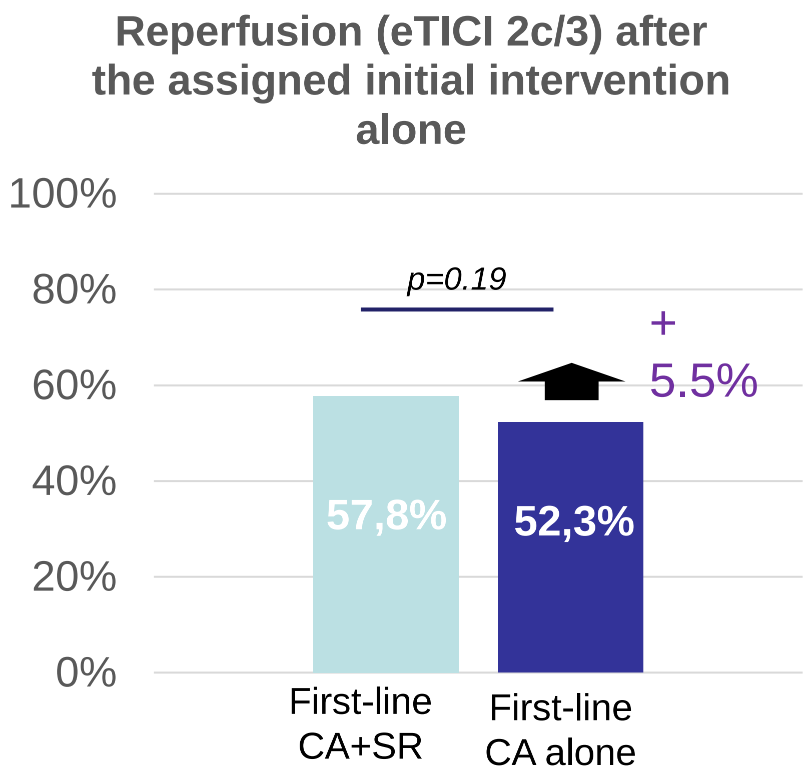
Ischemic Stroke

526 SVS+ ICA, M1 or M2 prox

Randomisation 1: 1

CA + Stent + <u>Balloon</u>	**CA + <u>Balloon</u>**

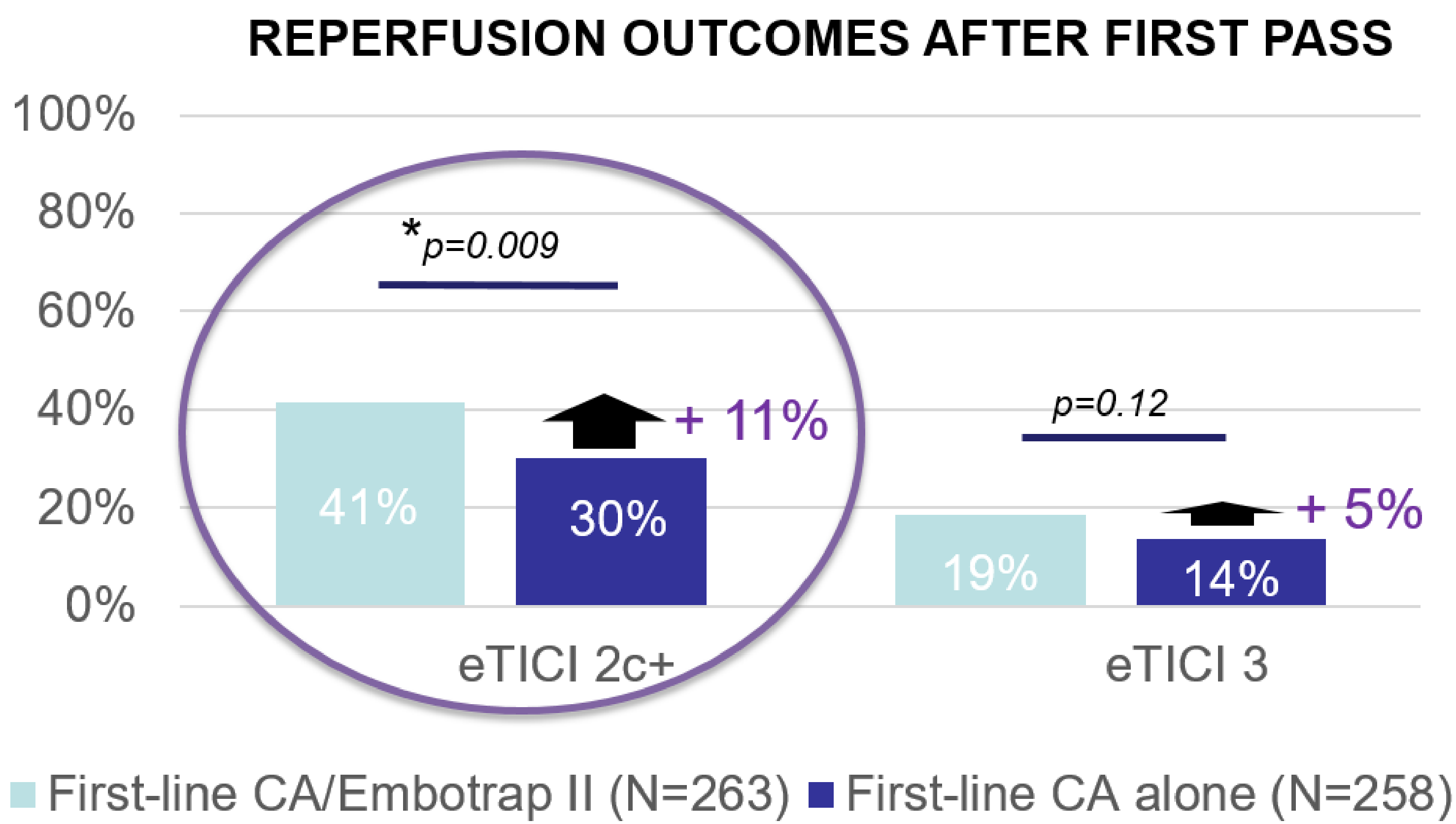
Results : Primary efficacy outcome



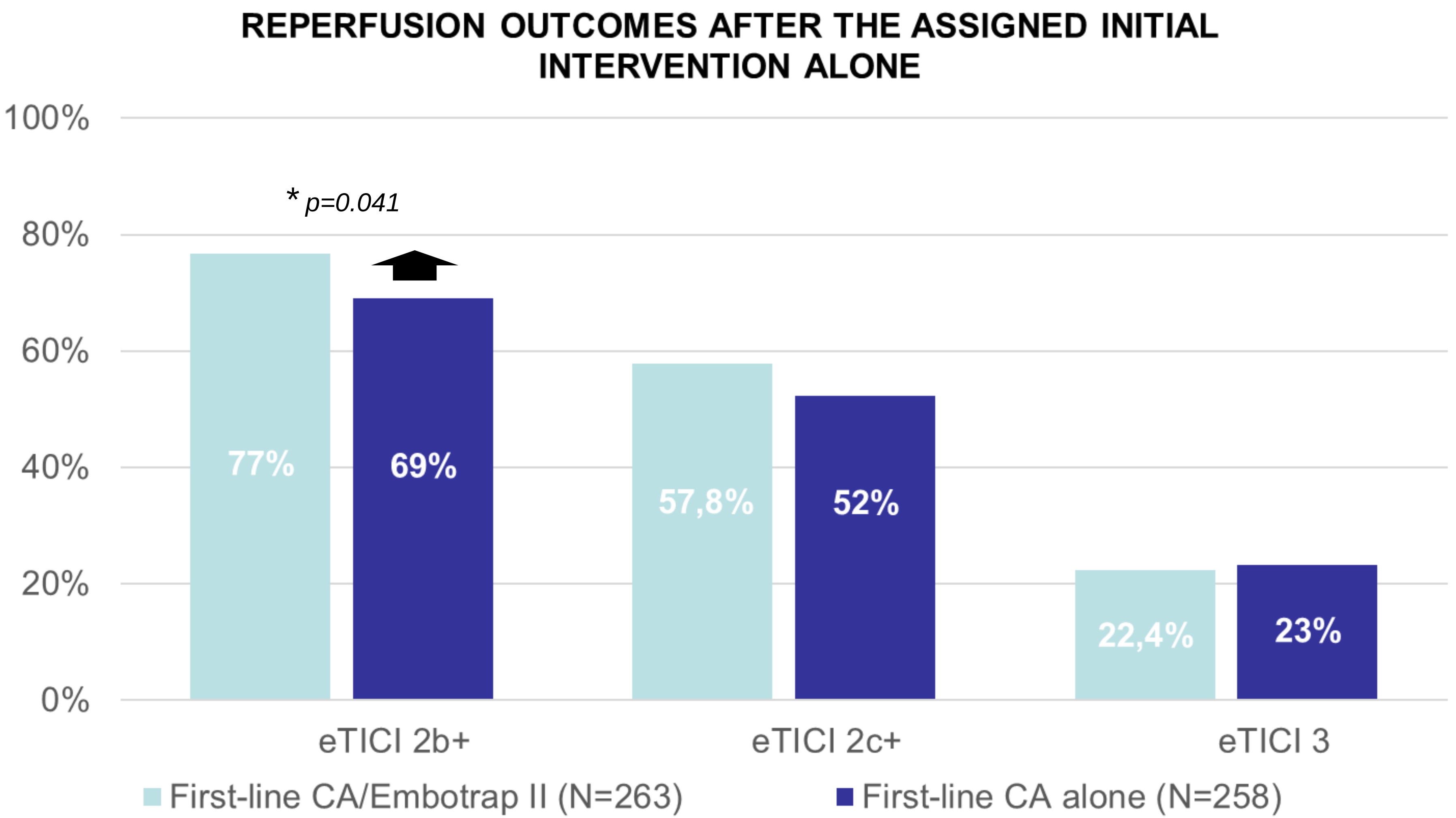
- *Effect sizes were calculated after adjustment for randomization stratification variables :*
  - *Center,*
  - *Age (≤80 vs. >80 years),*
  - *Intravenous thrombolysis*
  - *Occlusion site (isolated MCA versus MCA/ICA).*
  - *General Anesthesia*

- *eTICI not assessed by the core laboratory due to unavailable or poor quality images were imputed by multiple imputation (n=9 in each group).*

Secondary angiographic efficacy outcomes



Secondary angiographic efficacy outcomes



Negative Susceptibility Vessel Sign and Underlying Intracranial Atherosclerotic Stenosis in Acute Middle Cerebral Artery Occlusion

S.K. Kim, W. Yoon, T.W. Heo, M.S. Park, and H.K. Kang

Table 2: Comparison between the ICAS group and non-ICAS group

	ICAS Group (*n* = 18)	Non-ICAS Group (*n* = 73)	*P* Value
Age (yr)	63.8 ± 10.4	69.9 ± 11.4	.026
Male sex	11 (61.1%)	41 (56.2%)	NS
Risk factors			
Hypertension	12 (66.7%)	41 (56.2%)	NS
Diabetes mellitus	7 (38.9%)	7 (9.6%)	.002
Coronary artery disease	0 (0%)	5 (6.8%)	NS
Dyslipidemia	12 (66.7%)	17 (23.2%)	<.001
Smoking	3 (16.7%)	22 (30.1%)	NS
Atrial fibrillation	1 (5.6%)	38 (52.1%)	<.001
Congestive heart failure	0 (0%)	2 (2.7%)	NS
History of stroke or TIA	1 (5.6%)	11 (15.1%)	NS
Occlusion sites			
M1 segment	18 (100%)	66 (90.4%)	NS
M2 segment	0 (0%)	7 (9.6%)	NS
IV thrombolysis	7 (38.9%)	47 (64.4%)	NS
Time to procedure (min)	253.8 ± 115.9	250.5 ± 74.2	NS
Procedure time (min)	31.9 ± 9.3	33.6 ± 18.0	NS
Time to revascularization (min)	285.8 ± 117.8	284.3 ± 78.2	NS
Baseline NIHSS score	9.8 ± 3.6	12.7 ± 3.7	.003
m-TICI 2b or 3	18 (100%)	59 (80.8%)	.043
mRS 0–2	14 (77.8%)	35 (47.9%)	.034
Mortality	1 (5.6%)	8 (10.9%)	NS
N-SVS	18 (100%)	24 (32.9%)	<.001

Note:—N-SVS indicates negative susceptibility vessel sign; m-TICI, modified TICI; NS, non-significant.

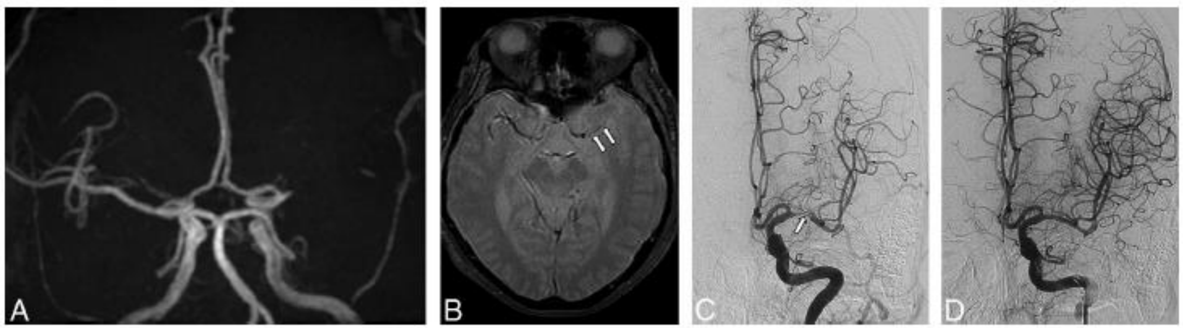
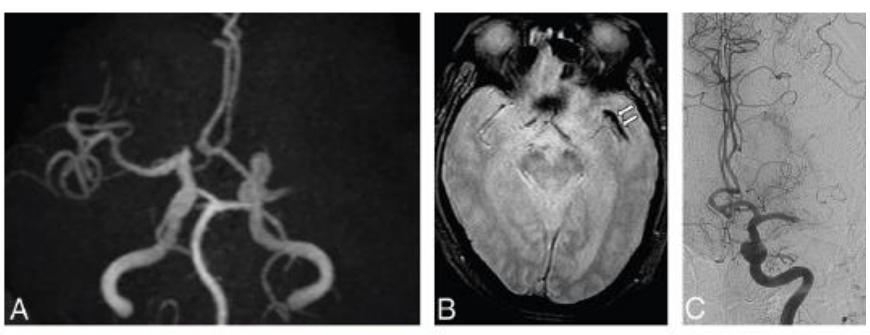


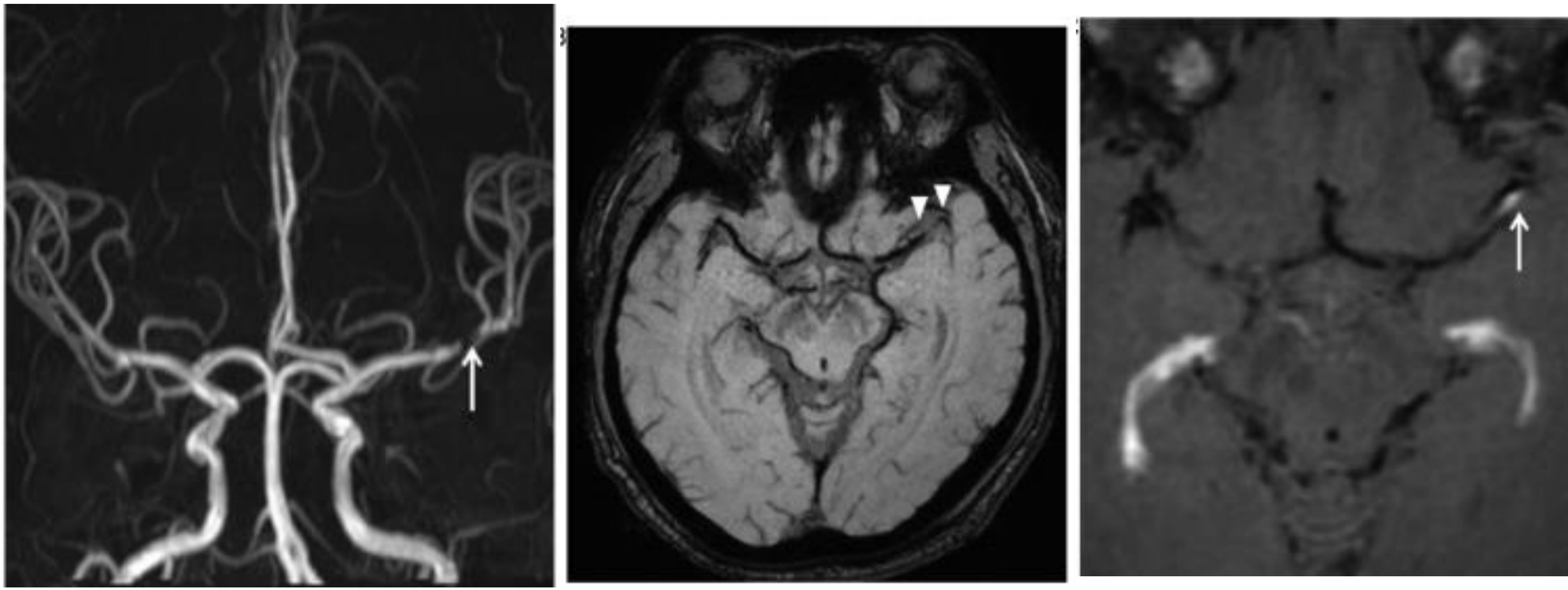
FIG 1. Brain images from a 74-year-old man with acute ischemic stroke and atherosclerotic stenosis in the MCA. *A*, 3D TOF MR angiography shows the occlusion in the proximal M1 segment of the left MCA. *B*, Axial gradient-echo image reveal… (*arrows*) in the M1 segment of the left MCA. *C*, Angiography after 1 passage of the Solitaire stent iden… proximal M1 segment of the left MCA. No thrombi were retrieved with the Solitaire stent. *D*, Angiograp… stent placement shows complete revascularization in the left MCA territory.

Table 3: Summary of GRE MRI findings according to occlusion sites

Location	ICAS Group (*n* = 18) SVS Absent	ICAS Group (*n* = 18) SVS Present	Non-ICAS Group (*n* = 73) SVS Absent	Non-ICAS Group (*n* = 73) SVS Present
M1	18	0	20	46
M2	0	0	4	3
Total (*n* = 91)	18	0	24	49

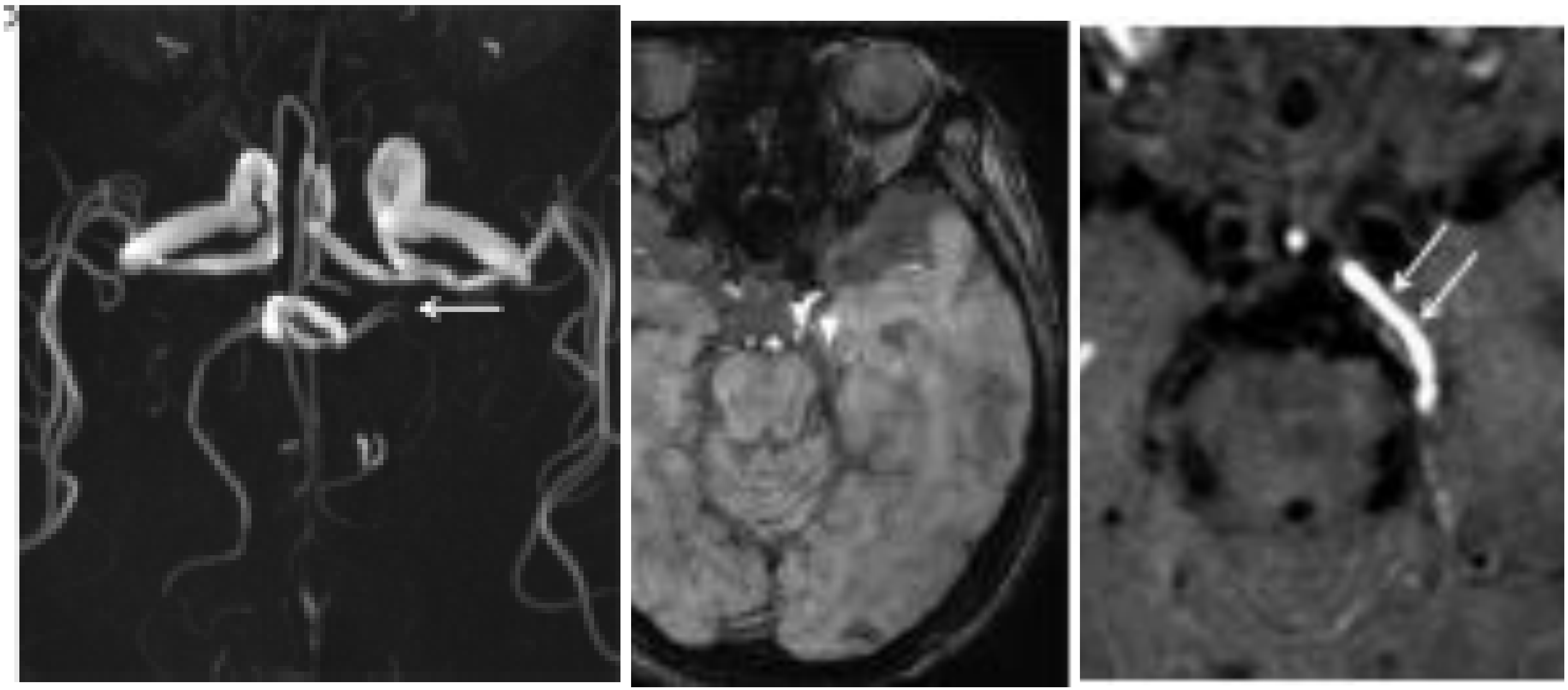


Et si pas de SVS …?



weak intensity, linear or eccentric morphology and focal length pattern = stenose

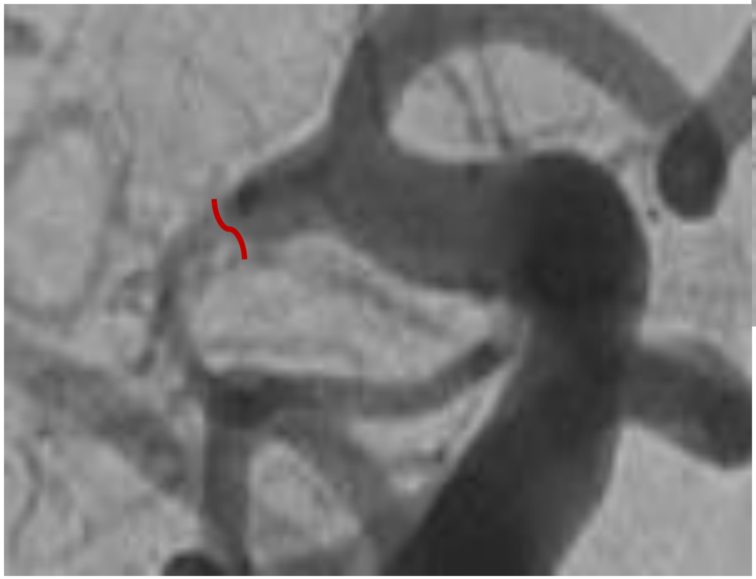
Sung Hyun Baik et al Eur. J. Radiol. 2018

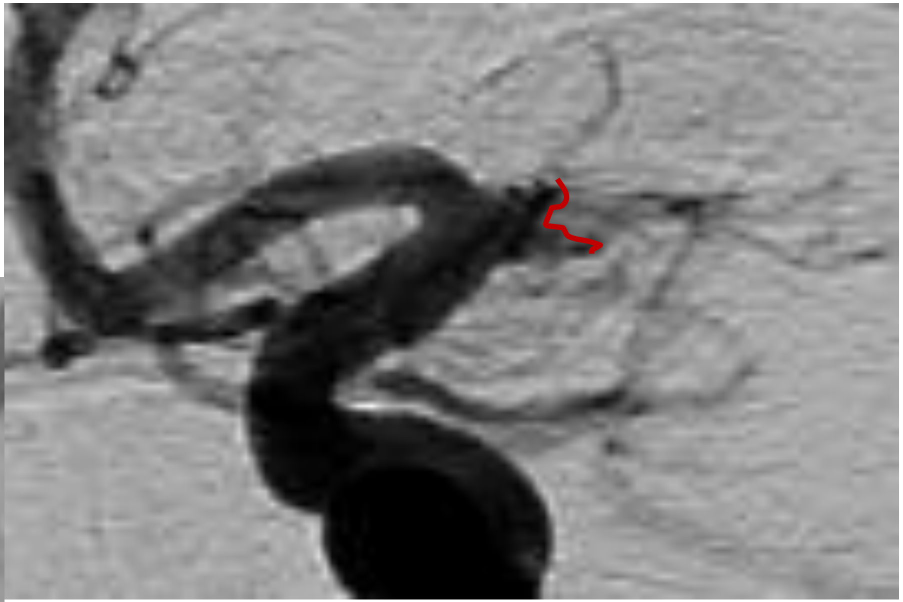


strong intensity, round or concentric morphology and segmental length pattern = occlusion

Sung Hyun Baik et al Eur. J. Radiol. 2018

Occlusion Régulière Vs Irrégulière

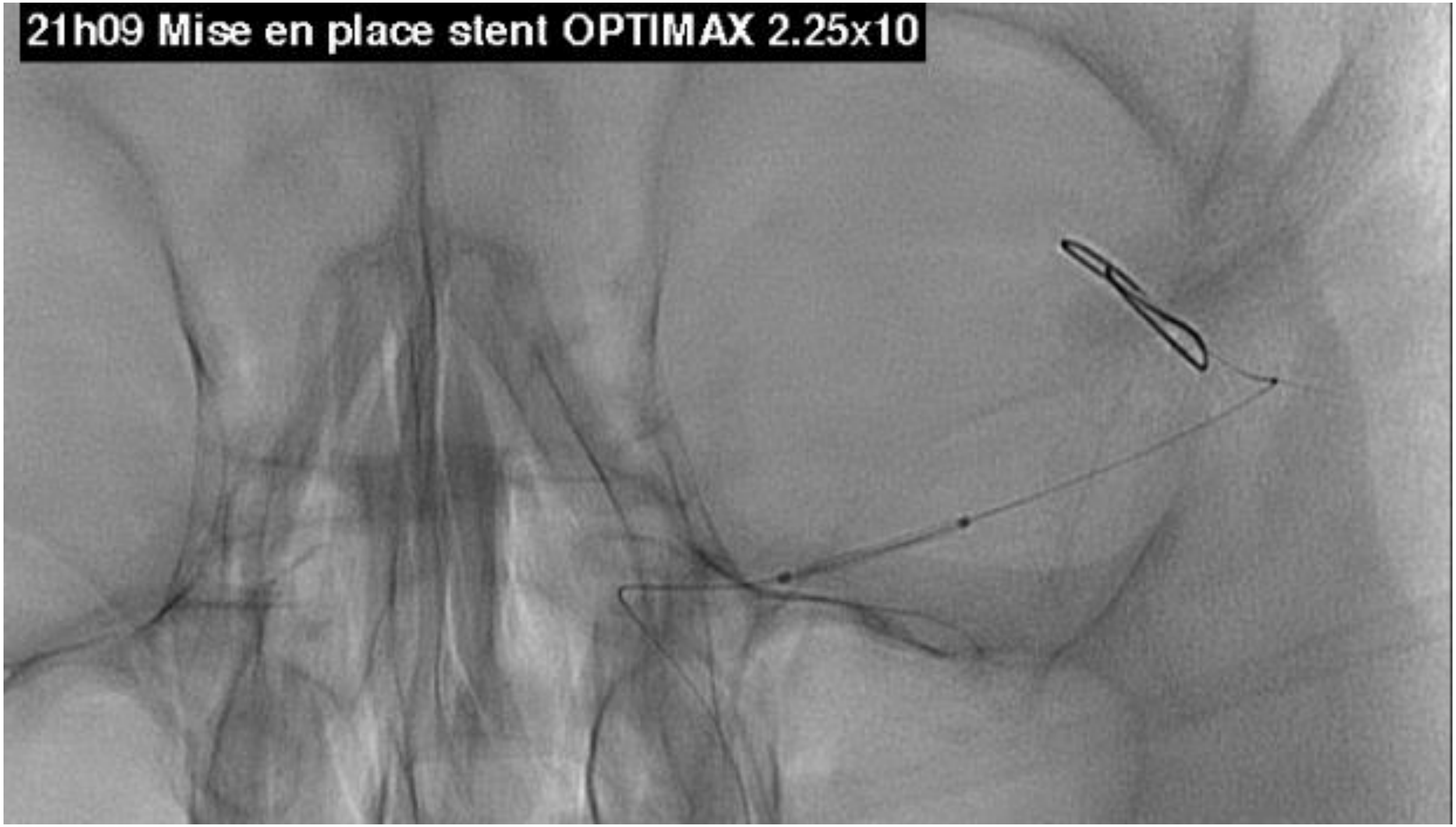


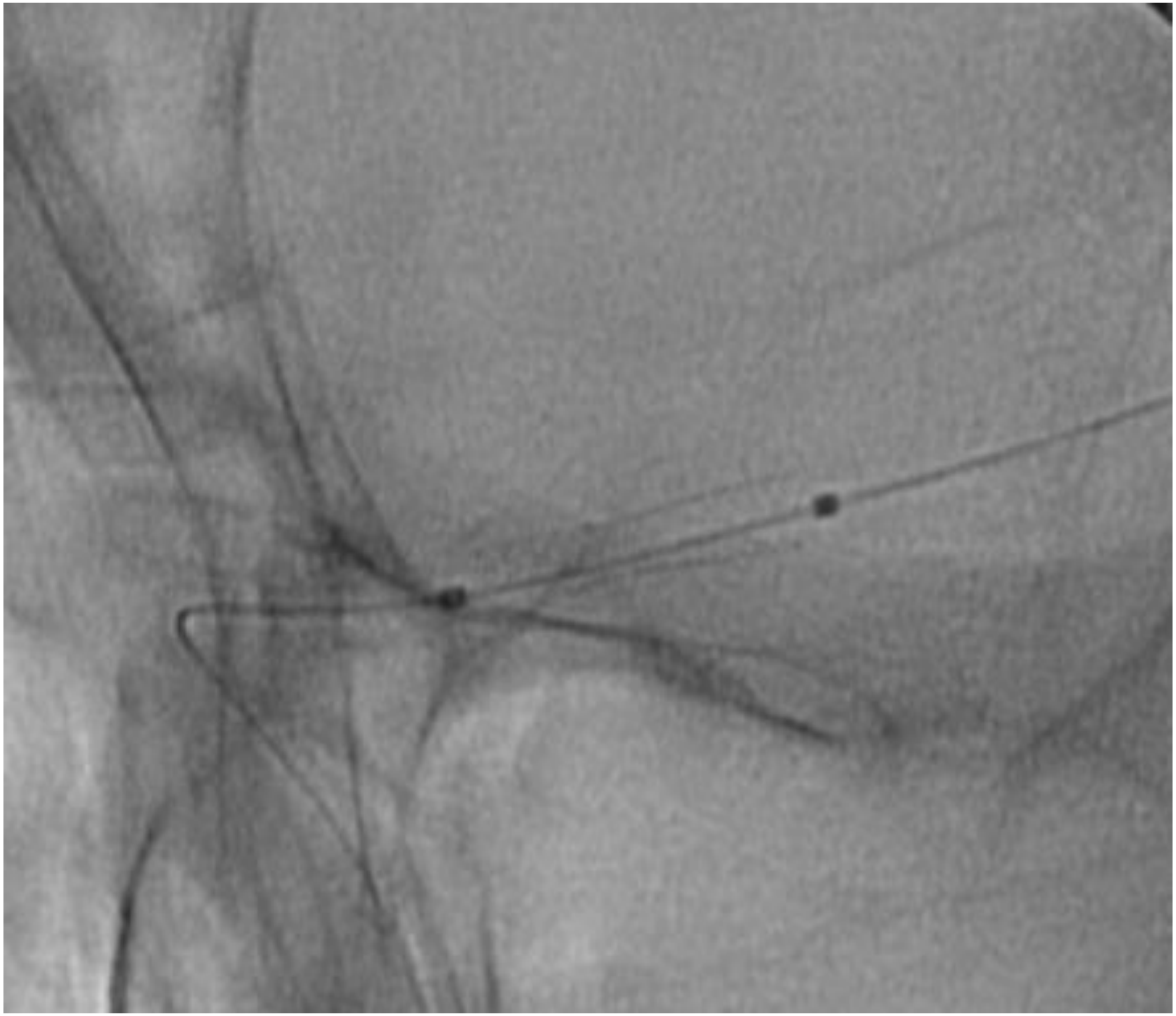


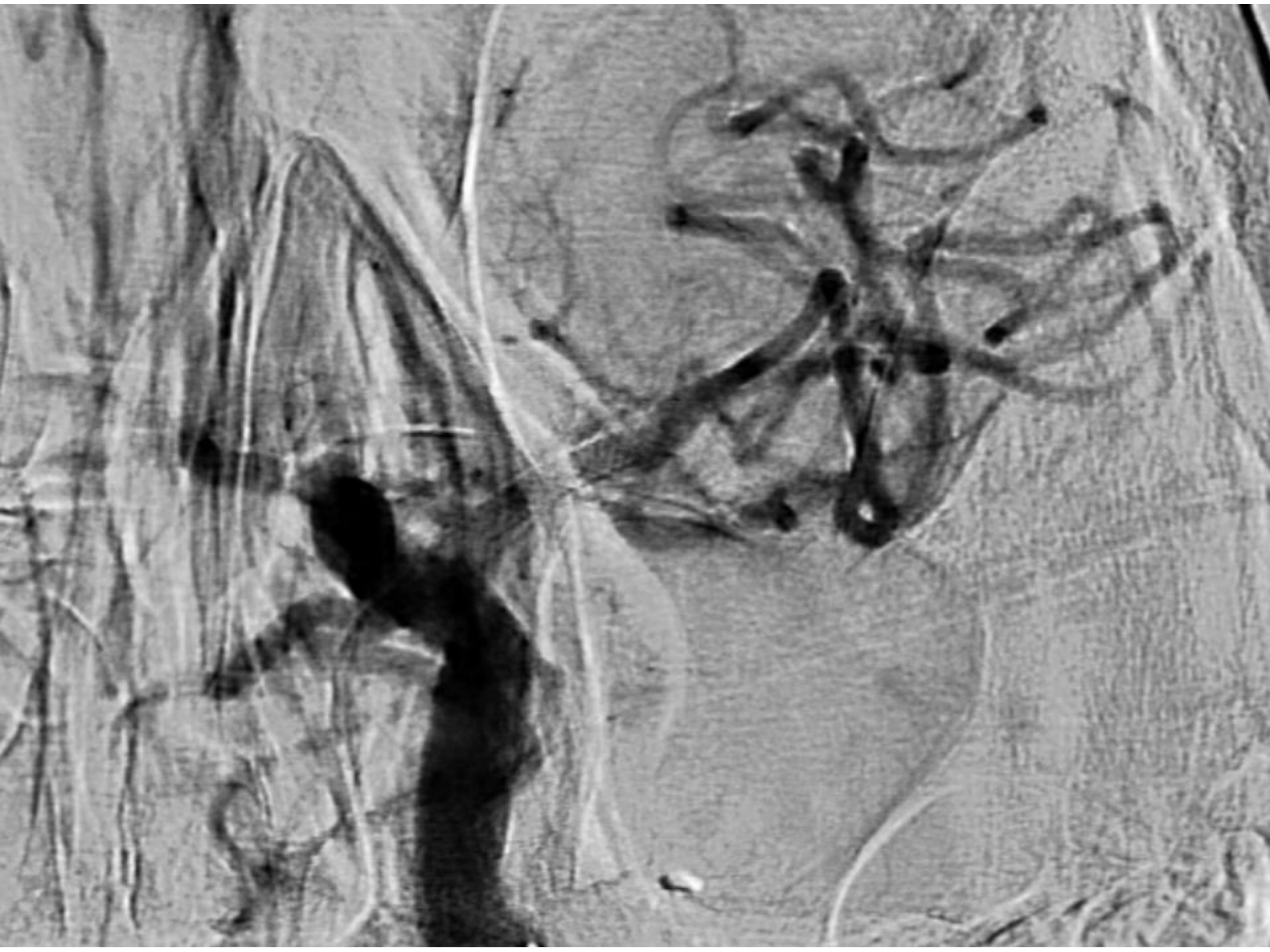
Consoli A. et al. Stroke 2018


20h16 CIG serie initiale
Merci 9F
20:15:53

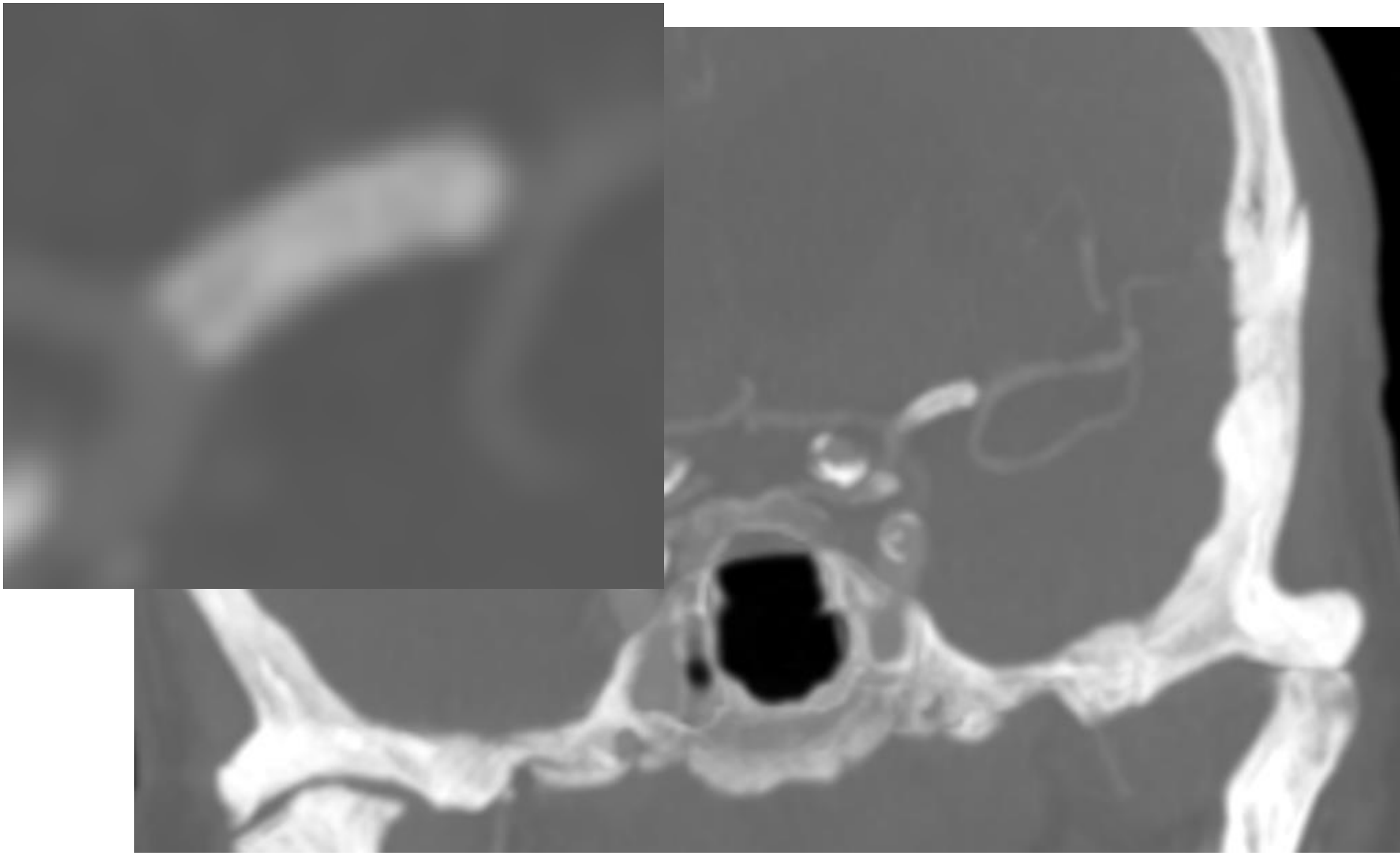

à 5 min

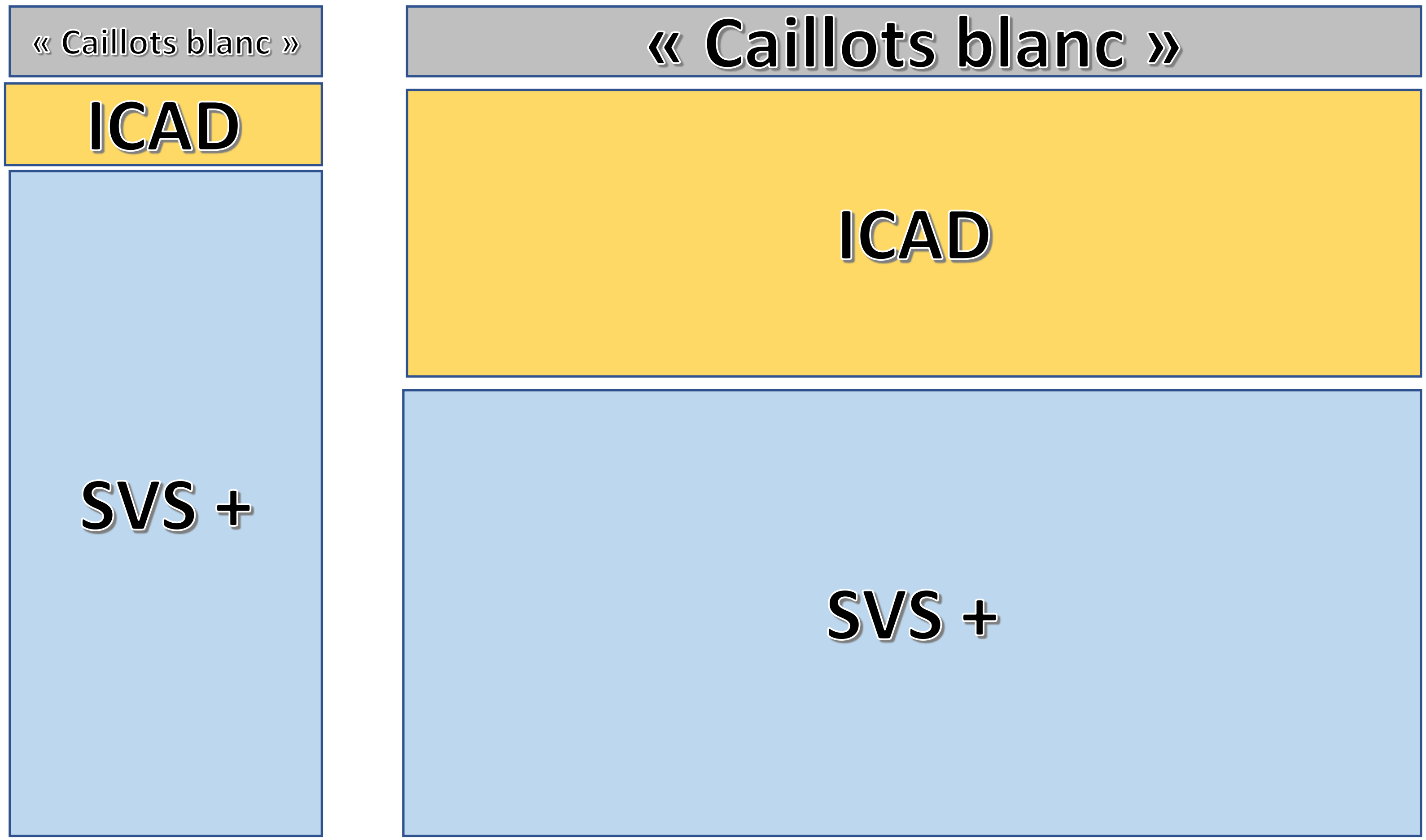

21h09 Mise en place stent OPTIMAX 2.25x10





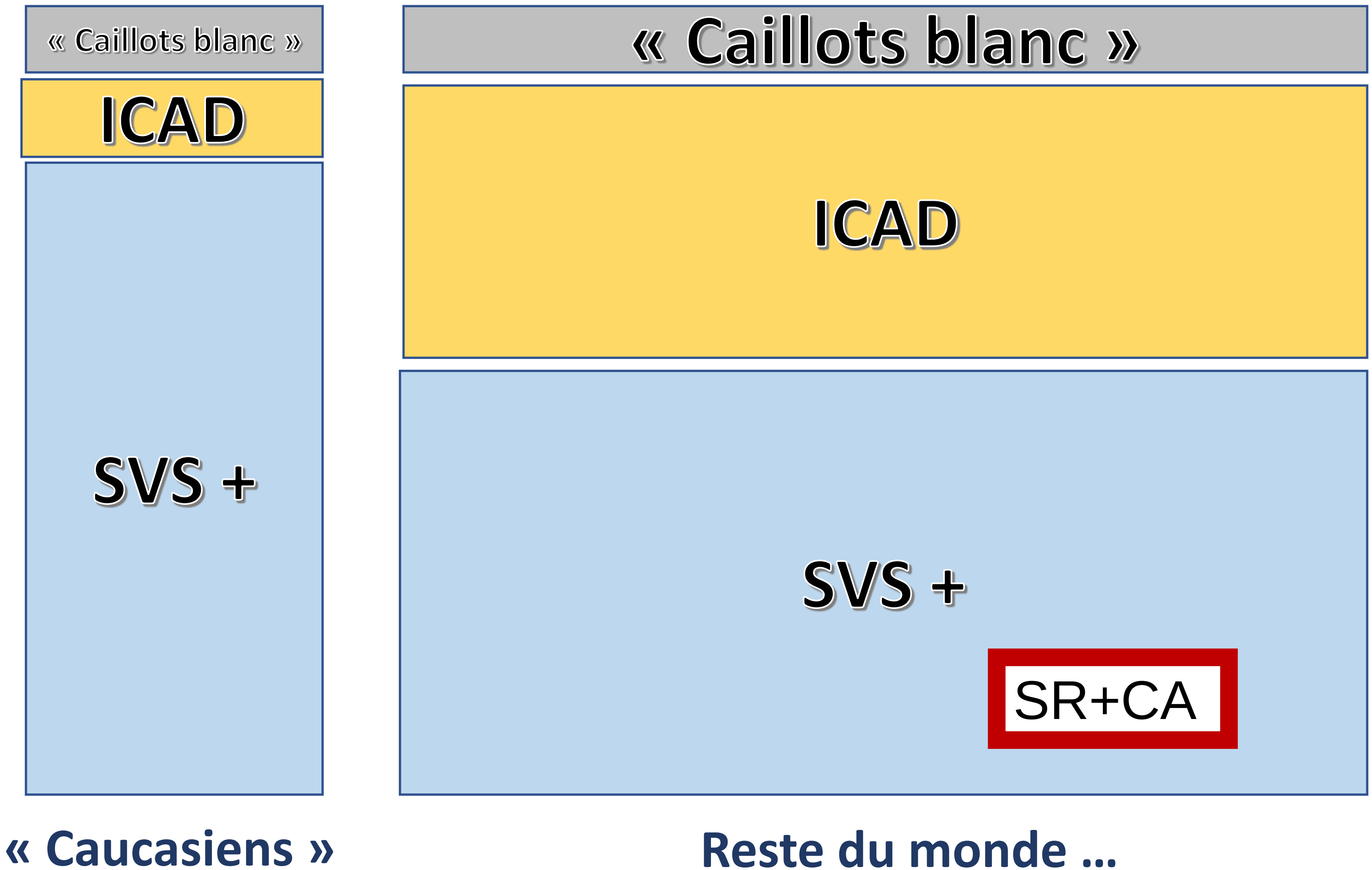
CTA M3

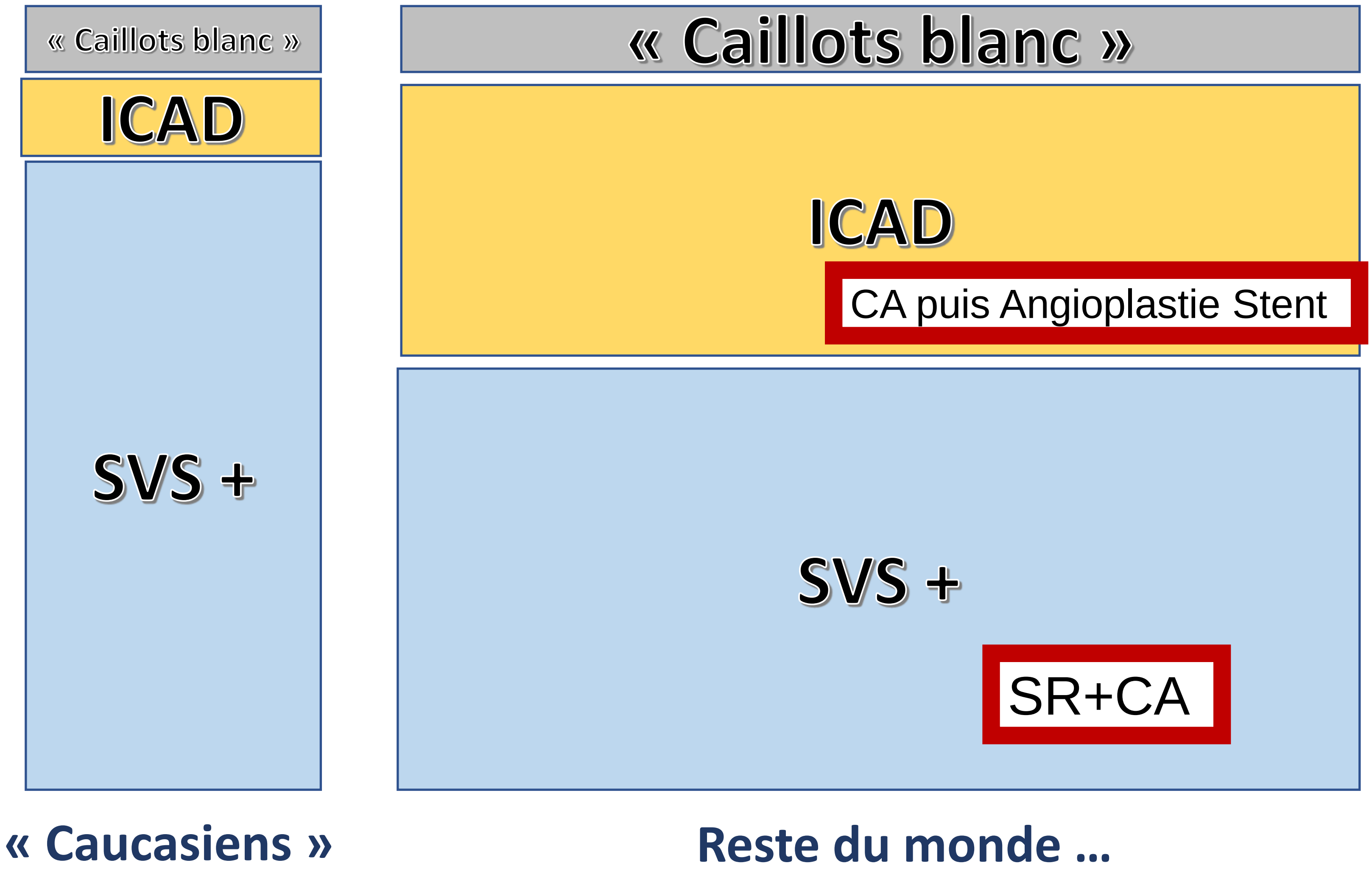


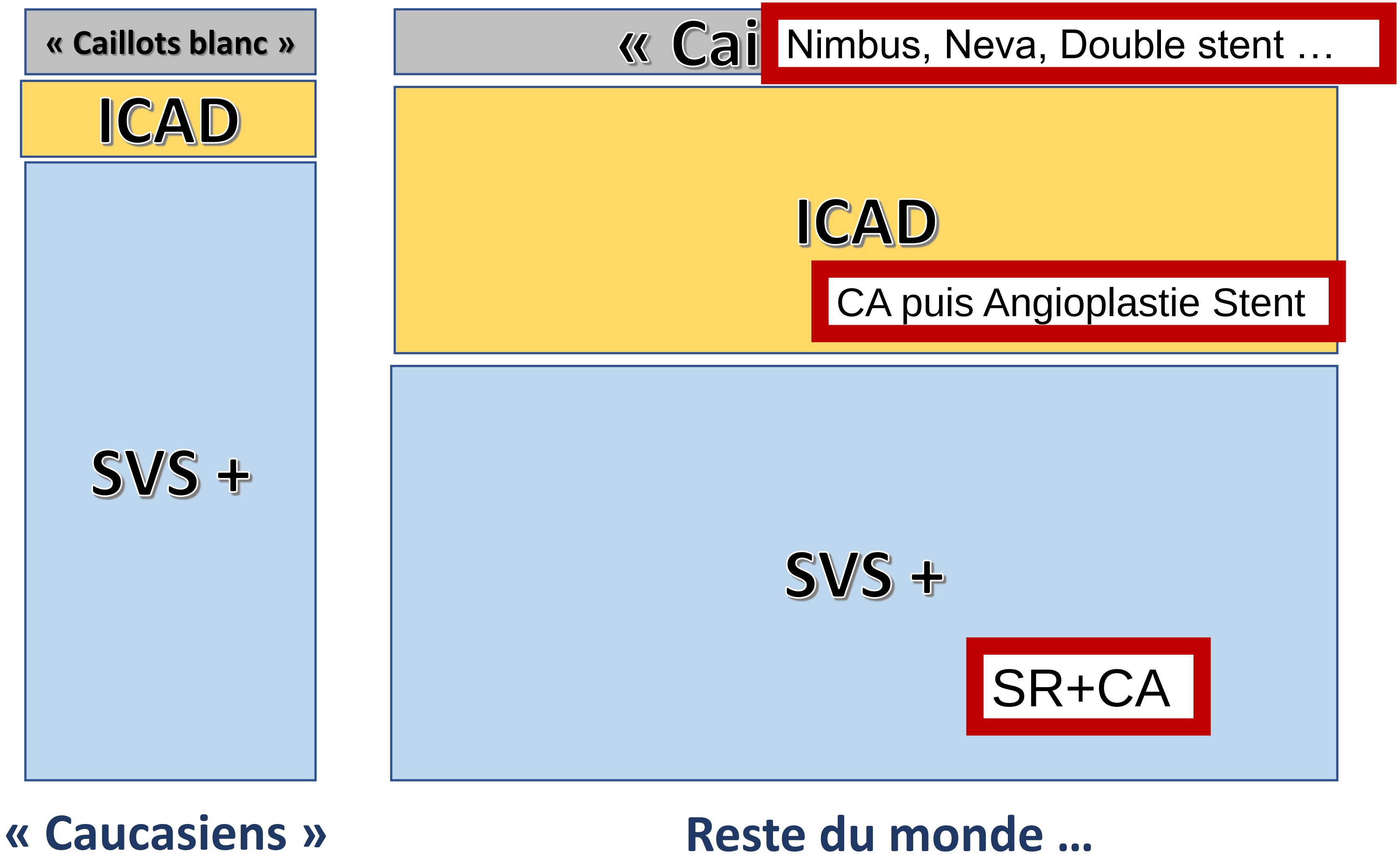


« Caucasiens »

Reste du monde …


« Caillots blanc »
ICAD
SVS +
« Caillots blanc »
ICAD
SVS +
SR+CA
« Caucasiens »
Reste du monde …


« Caillots blanc »
ICAD
SVS +
« Caillots blanc »
ICAD
CA puis Angioplastie Stent
SVS +
SR+CA
« Caucasiens »
Reste du monde …


« Caillots blanc »
ICAD
SVS +
« Cai
Nimbus, Neva, Double stent …
ICAD
CA puis Angioplastie Stent
SVS +
SR+CA
« Caucasiens »
Reste du monde …

A retenir

- L'IRM et le CT/ CTA, semblent fournir des éléments utiles pour évaluer le thrombus et :
  - Déterminer la cause de l'AVC
  - Optimiser les stratégies endovasculaires

A retenir

- Susceptibility vessel sign (SVS) lié à :
  - Meilleure recanalisation avec stent retrievers (combined SR+CA)
  - Prédominance de globule rouge dans le thrombus.

A retenir

- En l'absence de SVS clair :

  * Vérifier les paramètres de la séquence
  * Vérifier la présence d'une occlusion
  * Envisager l'injection

  * Observer le type d'occlusion en DSA
  * Premier passage avec aspi ?

Mission MT aux Antilles

La folle journée de l'anévrisme

Fin 2024

romain.bourcier@chu-nantes.fr

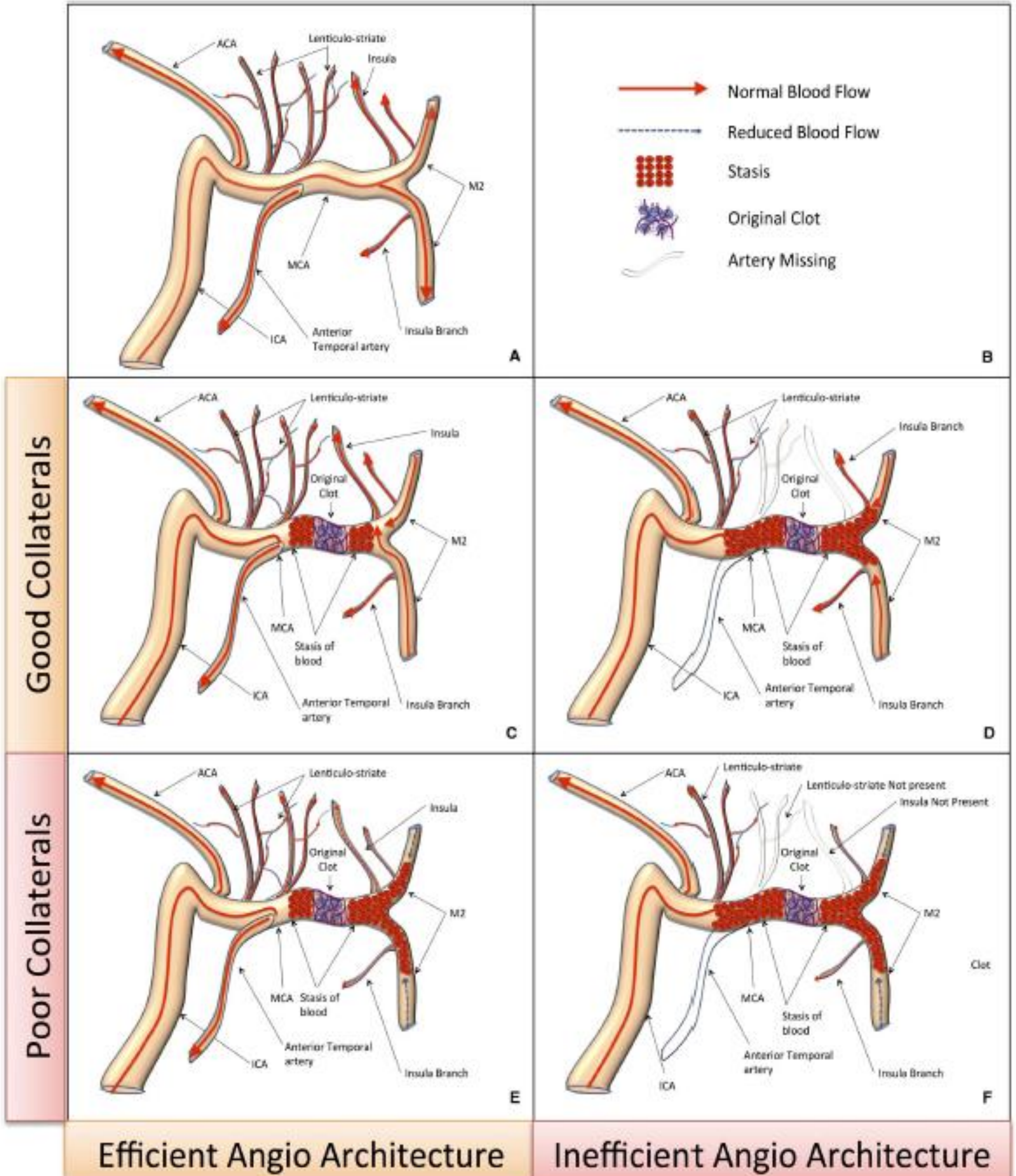
NeuroRadiologie CHU Nantes

ORIGINAL ARTICLE

Thrombus Characteristics Are Related to Collaterals and Angioarchitecture in Acute Stroke

Emmad M. Qazi, Sung Il Sohn, Sachin Mishra, Mohammed A. Almekhlafi, Muneer Eesa, Christopher D. d'Esterre, Abdul A. Qazi, Josep Puig, Mayank Goyal, Andrew M. Demchuk, Bijoy K. Menon

ABSTRACT: ***Background:*** We have theorized that clots with stasis are longer. We therefore explored the relationship between thrombus imaging characteristics on noncontrast computed tomography (NCCT) and magnetic resonance imaging (MRI) with clot length and pial collaterals on baseline computed tomography angiography (CTA). ***Methods:*** Prospective study of acute ischemic stroke patients (2005-2009) from Keimyung University. Patients with known stroke symptom onset time, baseline CTA, MRI, and with M1-Middle Cerebral Artery (MCA) ± intracranial internal carotid artery (ICA) occlusions were included. Clot length and pial collaterals were measured on baseline CTA. ***Results:*** A total of 104 patients (mean age 65.1 ± 12.28 years, 56.7% male, median baseline National Institutes of Health Stroke Scale 13) with intracranial ICA + MCA (n = 50) or isolated M1-MCA (n = 54) occlusions were included. Hyperdense sign on NCCT had a median clot length of 42.3 mm versus 29.5 mm when hyperdense negative ($p = 0.02$). Clots showing blooming artifact on gradient recall echo MRI had a median length of 39.1 mm versus 24.5 mm without blooming ($p = 0.005$). Patients with poor baseline collaterals on CTA had longer clots than those with intermediate/good collaterals (median clot length 49.4 mm vs 34.9 mm vs 20.5 mm respectively, $p < 0.001$). In censored logistic regression modeling, clot length was an independent predictor of hyperdense sign ($p = 0.05$) and of the presence of blooming artifact ($p = 0.006$). ***Conclusions:*** Clot length and baseline collateral status are independent predictors of clot hyperdensity on NCCT and blooming artifact on gradient recall echo. Longer clots are more likely to be hyperdense and to bloom more, probably because portions of these clots are freshly formed locally due to of stasis of blood around the original clot. This stasis could be because of poor collaterals and inefficient angio-architecture within the cerebral arterial tree.



ACA
Lenticulo-striate
Insula
M2
MCA
ICA
Anterior Temporal artery
Insula Branch
A
Normal Blood Flow
Reduced Blood Flow
Stasis
Original Clot
Artery Missing
B
Original Clot
Stasis of blood
C
D
Lenticulo-striate Not present
Insula Not Present
Clot
E
F
Good Collaterals
Poor Collaterals
Efficient Angio Architecture
Inefficient Angio Architecture

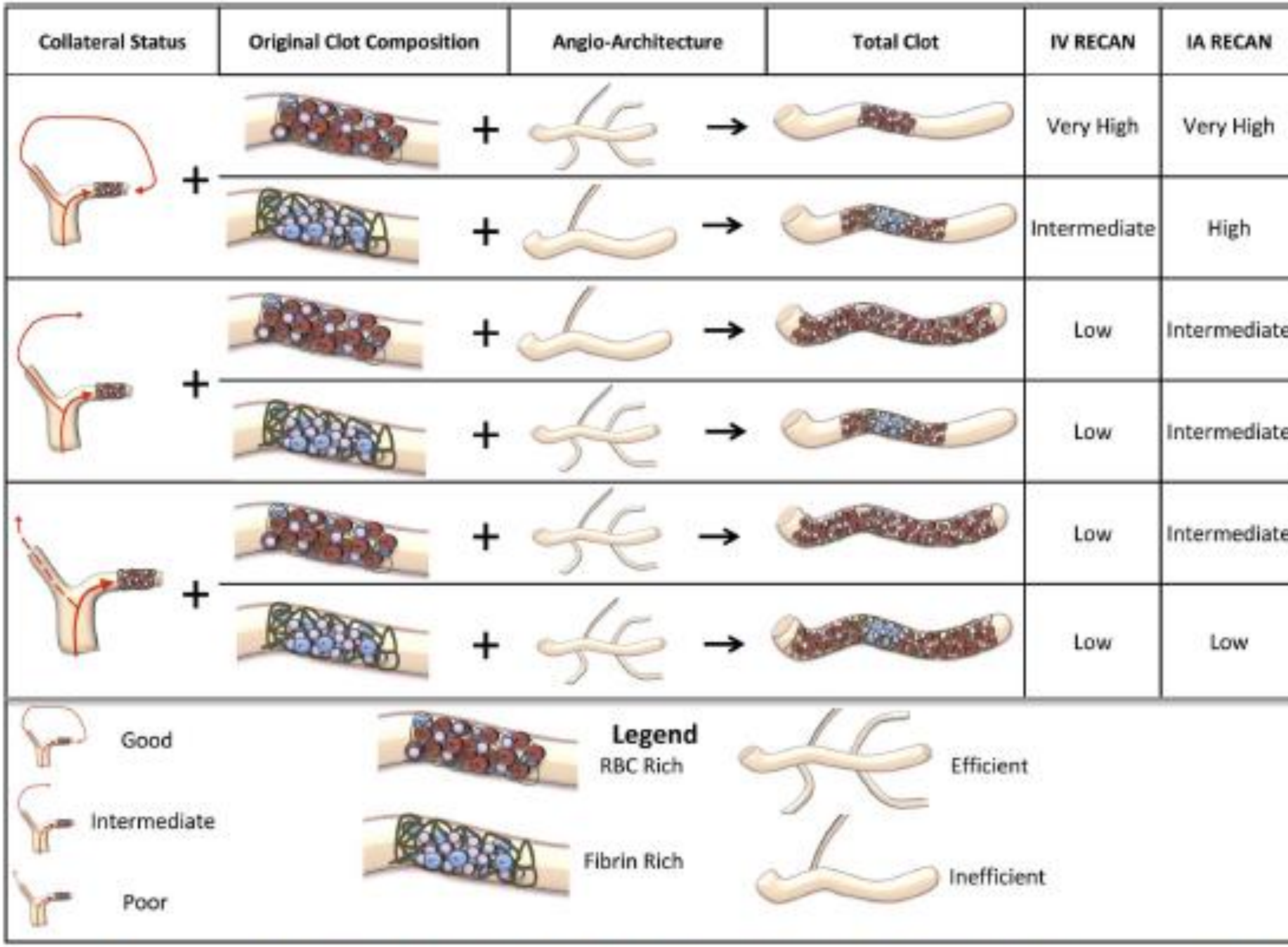


Figure 5: A theoretical explanation of clot characteristics on imaging and potential response to intravenous tPA and intra-arterial therapy based on collateral status, original clot composition, and efficiency of angio-architecture. These are theoretical responses to intravenous tPA that have not been tested but are based on the previously mentioned parameters. All possible combinations are not included.