THROMBECTOMIE PAR ASPIRATION: MODUS OPERANDI, TIP AND TRICKS ET COMPARAISON AVEC AUTRES TECHNIQUES

Raphaël BLANC
Wiliam BOISSEAU
Thomas METAYER

Depuis 2013…
Autres technologies que Stentriever

A DIRECT ASPIRATION FIRST PASS TECHNIQUE (ADAPT)

ORIGINAL RESEARCH

ADAPT FAST study: a direct aspiration first pass technique for acute stroke thrombectomy

Aquilla S Turk,[1] Don Frei,[2] David Fiorella,[3] J Mocco,[4] Blaise Baxter,[5] Adnan Siddiqui,[6] Alex Spiotta,[7] Maxim Mokin,[3] Michael Dewan,[8] Steve Quarfordt,[5] Holly Battenhouse,[9] Raymond Turner,[7] Imran Chaudry[1]

Table 2 Baseline characteristics

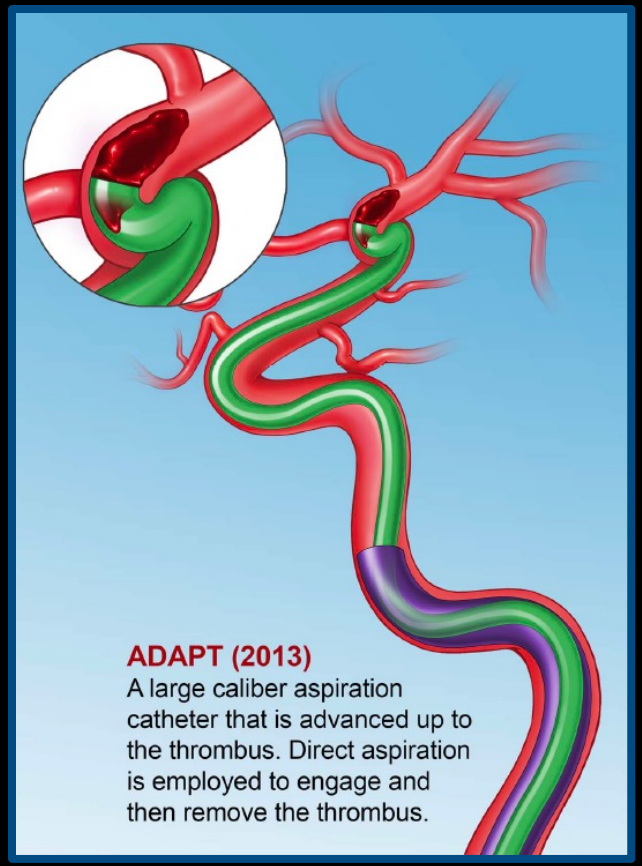
Variable	
Mean age (years)	66.3
Gender	
Men (n (%))	46 (47)
Women (n (%))	52 (53)
NIHSS	
Pretreatment	17.2/17.0*
Post-treatment	7.3/4.0*
IV tPA	
Yes (n (%))	27 (28)
No (n (%))	70 (72)
Average time to groin puncture (h)	8.5
Average time to TICI 2b/3 recanalization (min)	37
Site of occlusion (n (%))	
Right M1	20 (20)
Right M2	11 (11)
Right ICA	3 (3)
Right ICA terminus	3 (3)
Left M1	23 (23)
Left M2	7 (7)
Left ICA	6 (6)
Left ICA terminus	11 (11)
Basilar	5 (5)
Right cervical ICA–MCA	8 (8)
Left cervical ICA–MCA	3 (3)

*Mean/median values.
ICA, internal carotid artery; IV tPA, intravenous tissue plasminogen activator; MCA, middle cerebral artery; NIHSS, National Institutes of Health Stroke Scale; TICI, Thrombolysis in Cerebral Infarction.

Turk AS, *et al. J NeuroInterv Surg* 2014;**6**:260–264. doi:10.1136/neurintsurg-2014-011125

- n = 98 over 6 centers.
- Onset to Groin: 8.5 h (mean 507 min; median 241.5 min, SD=506 min).
- Successful revascularization rate (TICI 2b-3): 95%.
- Groin to TICI 2b or 3 revascularization was 36.6 min (SD=26.4 min).
- ADAPT technique alone was successful in achieving successful revascularization of the occluded vessel in 78% of the cases

2013 : ADAPT – Modus operandi



1- Montée du cathéter guide (introducteur long (type **Neuron Max**) ou cathéter à ballon) au niveau du segment cervical

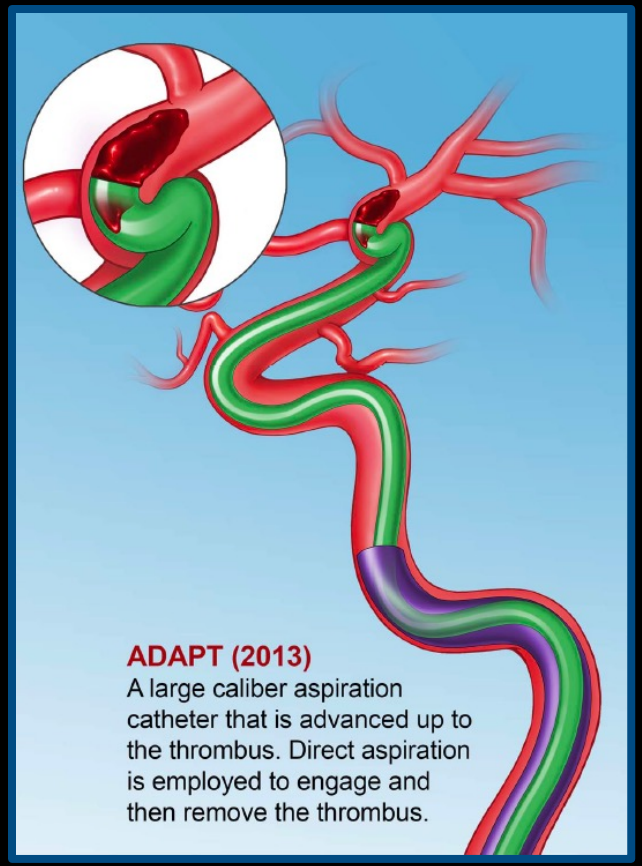
2- **Navigation du cathéter d'aspiration à la partie proximale du caillot** à l'aide d'un micro-cathéter et d'un micro-guide

- Nouvelles générations CA sont si flexibles → navigation possible sans micro catheter ni micro-guide (SNAKE technique)
- Si utilisation micro-cathéter/micro-guide → éviter si possible de franchir le thrombus (risque d'emboles distaux ? +++)
- Retrait micro-cathéter après avoir positionné le cathéter d'aspiration → augmente la puissance de l'aspiration ++

3- Connection du cathéter d'aspiration avec la pompe à aspiration

- Durée optimale aspiration ? Généralement 2-3 minutes

2013 : ADAPT – Modus operandi



4- Retrait lent et progressif du cathéter sous aspiration → **observation du tuyau et de la pompe d'aspiration +++**

– Si reflux immédiat
- Cathéter d'aspiration trop proximal **ou**
- Succès de l'aspiration avec caillot au sein de la pompe

– Absence de reflux → le caillot ou une partie du caillot est occlusif, au sein du cathéter d'aspiration

– Si reflux lors du retrait du cathéter :
- Succès de l'aspiration avec caillot au sein de la pompe
- Perte du caillot lors du retrait → contrôle prudent
- Si flux libre dans le cathéter d'aspiration → peut être laissé en place au sein du cathéter guide

ADAPT

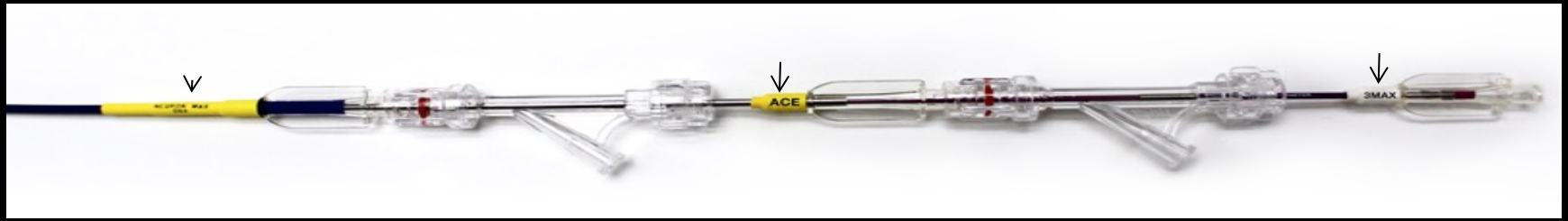
AVANTAGES

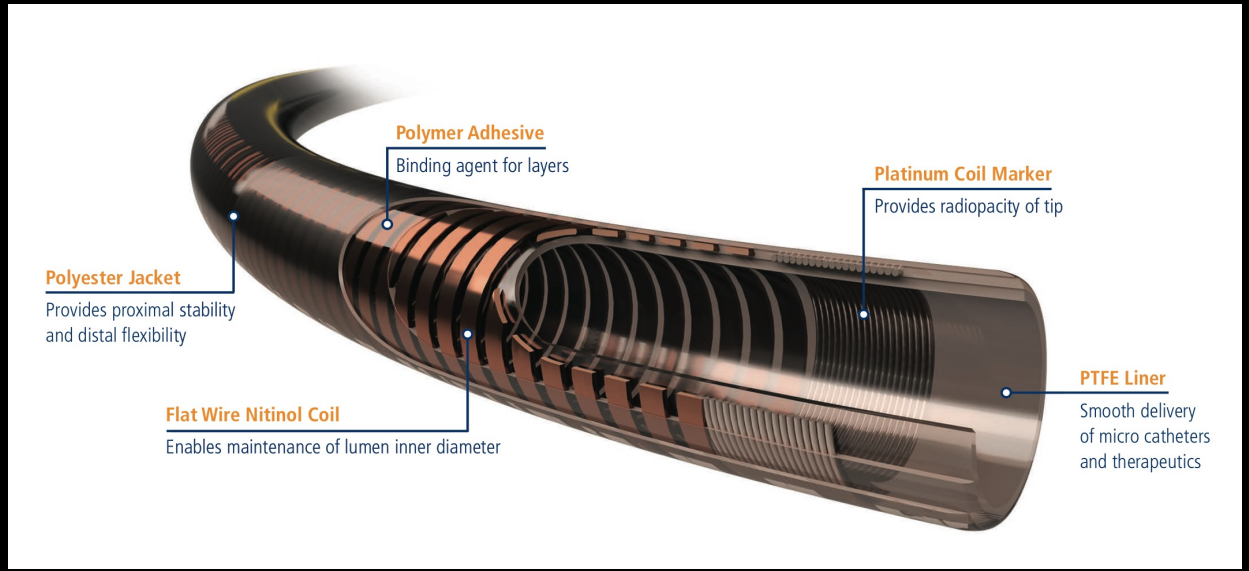
- Rapide +++ (ponction-recanalisation <10 minutes).
- Switch vers une stratégie « classique » (SR) facile +++
- Parfois possible sans traverser le caillot avec le microcathéter (donc pas de navigation aveugle, +/- moins de risque d'embolie distale?)
- Intéressant dans les occlusions du tronc basilaire +++

LIMITES

- Beaucoup de poussée/tension +++
- Misfit (artère ophtalmique +++)
- Spasme +++ (femmes jeunes)
- Plus long à « recharger » (4 mains/2 opérateurs +++)

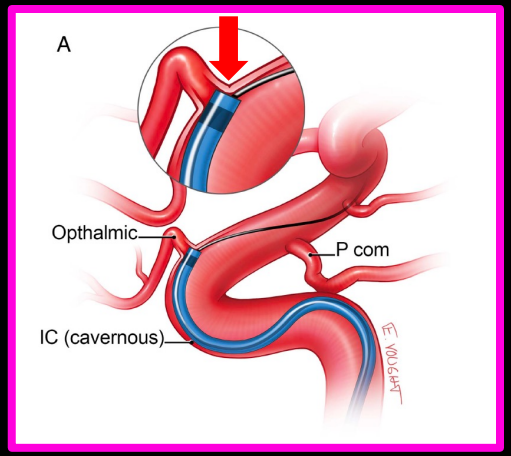
Installation Co-Axiale

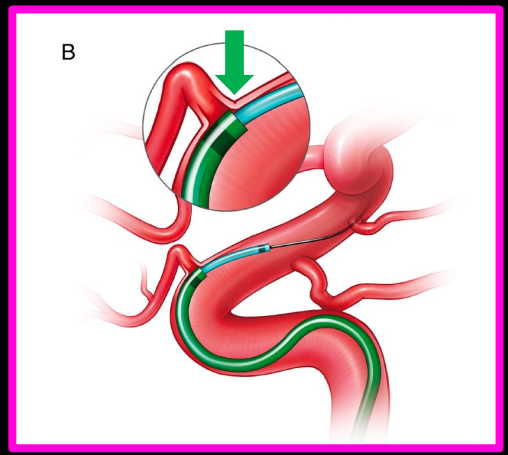




ADAPT - Tips & Tricks pendant le cathétérisme

- **Attention à la tension accumulée (montée du Neuron Max lors du retrait)**
- **Misfit -> cathéter d'aspiration qui « bute » contre l'ostium de l'artère ophtalmique**





ADAPT - Tips & Tricks pendant le cathétérisme

New devices

ORIGINAL RESEARCH

2019 JNIS

Sofia intermediate catheter and the SNAKE technique: safety and efficacy of the Sofia catheter without guidewire or microcatheter construct

Jeremy J Heit,[1] Johnny HY Wong,[1] Adrienne M Mofaff,[1] Nicholas A Telischak,[2] Robert L Dodd,[3] Michael P Marks,[1] Huy M Do[1]

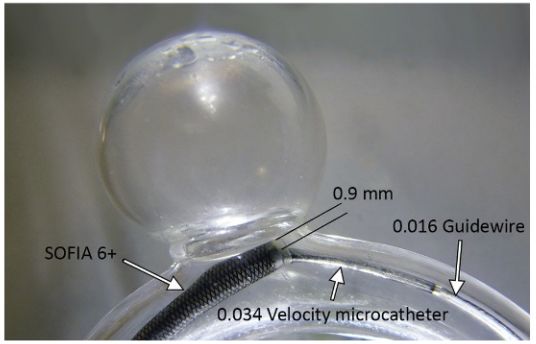


Figure 1. In silicone model of the ledge effect. A Sofia 6+ catheter fitted with an inner Velocity microcatheter is shown stuck at an irregularity in the wall, while in the process of advancing through a tube, over a 0.016 guide wire. The gap between the Sofia 6+ catheter and the Velocity catheter is 0.9 mm.

Use of the Rocket Technique after Failure of the Direct Aspiration First-Pass Technique in Acute Stroke Thrombectomy

Yves Chau, MD, Paolo Arnoffi, MD, Laurent Suissa, MD, PhD, Sylvain Lachaud, MD, Quentin Varnier, FHM, MD, and Jacques Sédat, MD

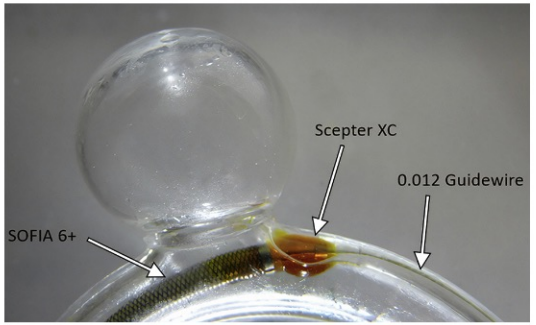
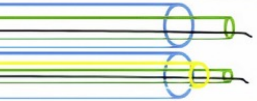
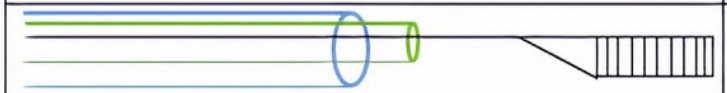


Figure 2. In silicone model of the rocket technique. A Scepter XC 4-11 balloon is placed through the Sofia 6+

ADAPT - Tips & Tricks pendant le cathétérisme

	Technique name	Author
	SNAKE	Heit (1)
		
	Bumper technique Double wire technique	Kellner (2) Lee (3)
		Adrianto (4)
	Coaxial advancement technique	Kang (5) Yoo (6)

	ANTRACK technique	Lin (7)
	Coaxial and double wire technique	Lee (3)
		Pfaff (8)
	Rocket technique	Takahira (9)

The different components are the large-bore aspiration catheter (blue), the intermediate catheter (yellow), the microcatheter (green), the delivery assist catheter or the compliant balloon (orange), and the microwire (black)

ADAPT - Tips & Tricks
Facteurs techniques influençant le succès de l'aspiration

- **1- Diamètre interne du cathéter d'aspiration (ID) ++**

Larger ACE 68 aspiration catheter increases first-pass efficacy of ADAPT technique

Josser E Delgado Almandoz,[1] Yasha Kayan,[1] Adam N Wallace,[1] Ronald M Tarrel,[2] Jennifer L Fease,[1] Jill Marie Scholz,[1] Anna M Milner,[1] Pezhman Roohani,[2] Maximilian Mulder,[3] Mark L Young[2]

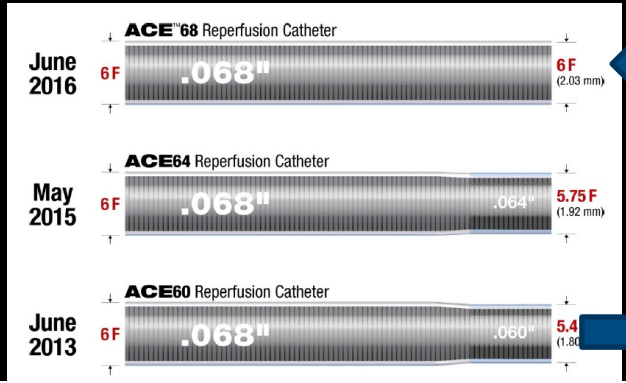


Table 2 Efficacy of the ADAPT technique with larger-bore ACE aspiration catheters

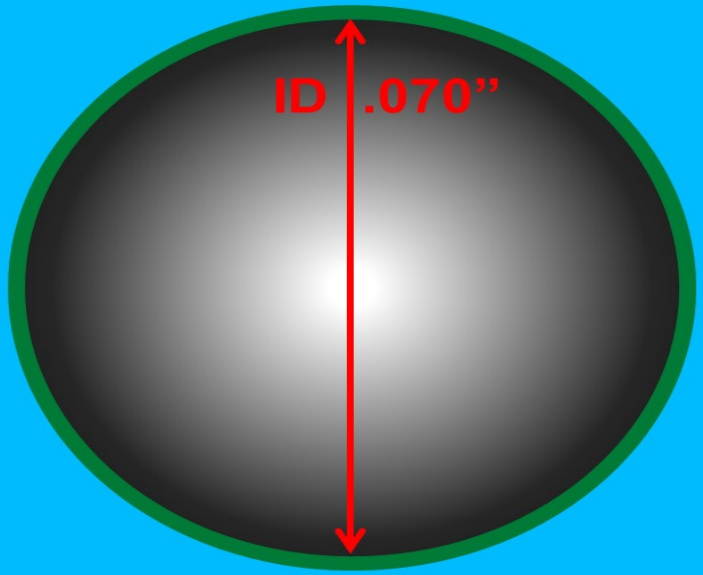
	All cases, n=152 (%)	ACE 60, n=57 (%)	ACE 64, n=35 (%)	ACE 68, n=60 (%)	P values
Mean time puncture to reperfusion, minutes	34.5	44.4	30.2	27.7	0.02*/0.003†
Median time puncture to reperfusion, minutes	24	30	26	19.5	n/a
Mean number of ADAPT passes	2.3	2.3	2.5	2	0.6*/0.8†
Median number of ADAPT passes	2	2	2	1	n/a
Overall successful reperfusion‡	137 (90)	50 (88)	32 (91)	55 (92)	0.74
Successful reperfusion‡ using ADAPT only	122 (80)	38 (67)	31 (89)	53 (88)	**0.005**
Successful reperfusion‡ after first ADAPT pass	64 (42)	19 (33)	13 (37)	32 (53)	0.07/**0.04**§

Sofia PLUS vs Sofia 5F Comparison

Capture larger, harder clots quicker with less blockage

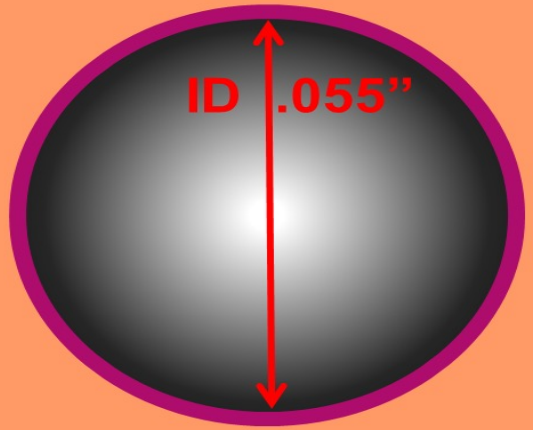
Sofia Plus

*Flow Rate = 16 mL/sec
(at 100 psi)



Sofia DAC

*Flow Rate = 7.7 mL/sec
(at 100 psi)



Sofia Plus provides 108% more flow rate

*Using 70% contrast/saline solution

Microvention SOFIA - ETIS

First-Line Sofia Aspiration Thrombectomy Approach within the Endovascular Treatment of Ischemic Stroke Multicentric Registry: Efficacy, Safety, and Predictive Factors of Success

G. Marnat, X. Barreau, L. Detraz, R. Bourcier, B. Gory, A. Sgreccia, F. Gariel, J. Berge, P. Menegon, M. Kyheng, J. Labreuche, A. Consoli, R. Blanc, and B. Lapergue, on behalf of the ETIS Investigators

- 296 patients inclus depuis le registre ETIS
- Evaluation aspiration première approche avec SOFIA
- TICI 2b,c,3 = 86,1 % dont TICI 3 = 41,2 %
- First pass effect = 24,2 %
- Taux de complication 9,5 %
- 43 % de patients mRS <=2
- Autres : Rescue dans 29.7%, intérêt du Sofia+, M1 et TB

ADAPT - Tips & Tricks
Facteurs techniques influençant le succès de l'aspiration

- **2- Retrait du micro-cathéter +++ → augmente la force d'aspiration**

- **3- Utilisation de systèmes d'aspiration avec une force d'aspiration plus importante +++**

A technical comparison of thrombectomy vacuum aspiration systems

Kurt Yaeger,[1,2] Annabelle Iserson,[1] Paul Singh,[1,3] Jacob Wolf,[2] Ester Vidal,[1] Thomas Oxley,[1,2] Anthony B Costa,[1,2] Johanna T Fifi[1,3]

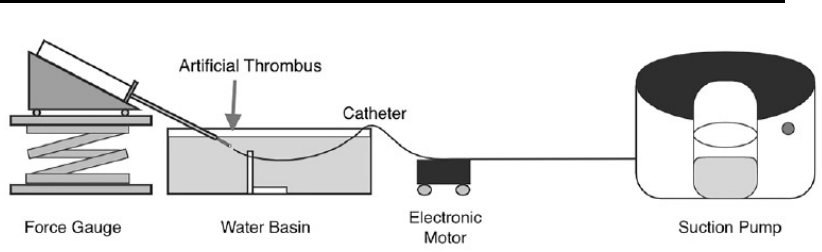
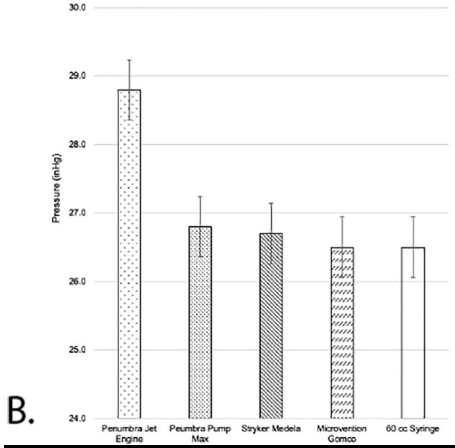
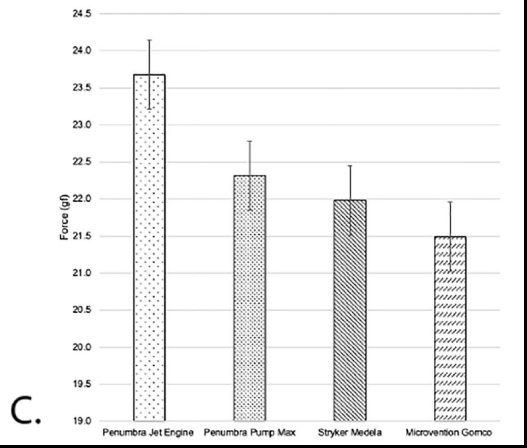


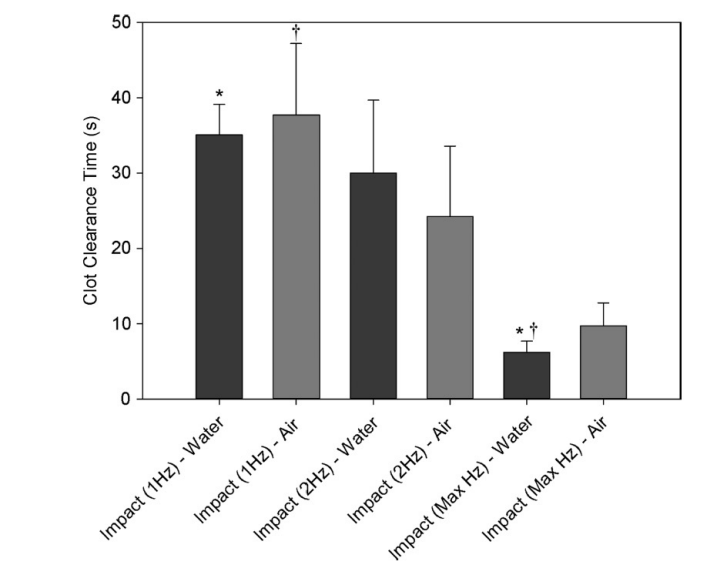
Figure 1 Diagram outlining the automated suction catheter pull test set up.





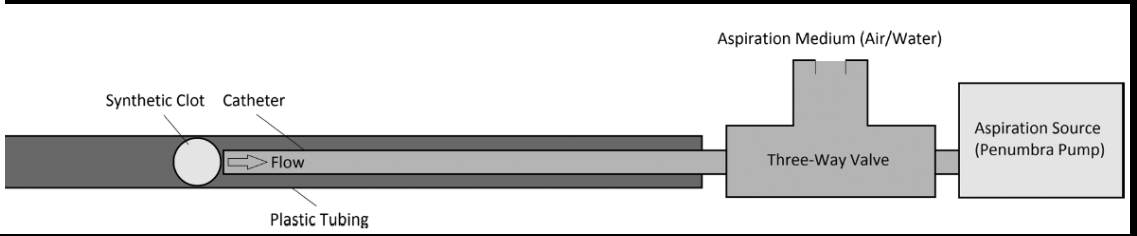
ADAPT - Tips & Tricks
Facteurs techniques influençant le succès de l'aspiration

- 4- Aspiration cyclique ?



Exploring the efficacy of cyclic vs static aspiration in a cerebral thrombectomy model: an initial proof of concept study

Scott Simon,[1] Casey Paul Grey,[2] Trisha Massenzo,[2] David G Simpson,[3] P Worth Longest[4,5]



ADAPT - Tips & Tricks
Facteurs techniques influençant le succès de l'aspiration

- 5- Intérêt de l'utilisation d'un cathéter à ballon ?

Effect of balloon guide catheter utilization on contact aspiration thrombectomy

Dong-Hun Kang, MD,[1] Byung Moon Kim, MD,[2] Ji Hoe Heo, MD,[3] Hyo Suk Nam, MD,[3] Young Dae Kim, MD,[3] Yang-Ha Hwang, MD,[4] Yong-Won Kim, MD,[4] Yong-Sun Kim, MD,[5] Dong Joon Kim, MD,[2] Hyo Sung Kwak, MD,[6] Hong Gee Roh, MD,[7] Young-Jun Lee, MD,[8] and Sang Heum Kim, MD[9]

ADAPT - Tips & Tricks
Facteurs techniques influençant le succès de l'aspiration

- **6- Influence du délai entre le début des symptômes et la réalisation de la thrombectomie ?**

		Successful reperfusion Status		
	Overall	No (TICI 0/1/2a)	Yes (TICI 2b/3)	*P Value**
Number of patients	*347*	*154*	*193*	
Age, y mean± SD	66.4 ± 14.7	65.9 ± 15.1	66.8 ± 14.5	0.57
Female	159 (45.8)	71 (46.1)	88 (45.6)	0.92
Hypertension	196 (56.7)	87 (56.5)	109 (56.8)	0.96
Diabetes	68 (19.7)	31 (20.1)	37 (19.3)	0.84
Dyslipidemia	81 (23.4)	20 (18.8)	52 (27.1)	0.072
Current smoking	76 (22.0)	38 (24.7)	38 (19.8)	0.28
Antithrombotic medications	117 (33.9)	47 (30.7)	70 (36.5)	0.26
Admission NIHSS score, median (IQR)	17 (11-20)	17 (12-20)	16 (11-20)	0.78
DWI-ASPECTS<7	115 (34.7)	57 (39.3)	58 (31.2)	0.12
Site of occlusion				
MCA	200 (57.6)	69 (44.8)	131 (67.9)	<0.001
ICA siphon	89 (25.6)	56 (36.4)	33 (17.1)	
ICA siphon and MCA	58 (16.7)	29 (18.8)	29 (15.0)	
Left side occlusion	174 (50.1)	78 (50.7)	96 (49.7)	0.87
Cardio-embolic stroke aetiology	181 (52.2)	78 (50.7)	103 (53.4)	0.61
Previous use of IV thrombolysis	226 (65.1)	95 (61.7)	131 (67.9)	0.23
General anesthesia	65 (18.7)	34 (22.1)	31 (16.1)	0.15
Onset to clot contact, min, median (IQR)	283 (234-354)	301 (240-377)	269 (232-339)	0.003
Onset to groin puncture	*255 (210-324)*	*274 (217-330)*	*245 (207-315)*	*0.008*
Groin puncture to clot contact	*25 (17-33)*	*27 (18-37)*	*22 (16-30)*	*0.006*

Values expressed as number (percentage) unless otherwise indicated. * P-values calculated using Student t test or Mann-Whitney U test or Chi-square test as appropriate.

Predictors of the Aspiration Component Success of a Direct Aspiration First Pass Technique (ADAPT) for the Endovascular Treatment of Stroke Reperfusion Strategy in Anterior Circulation Acute Stroke

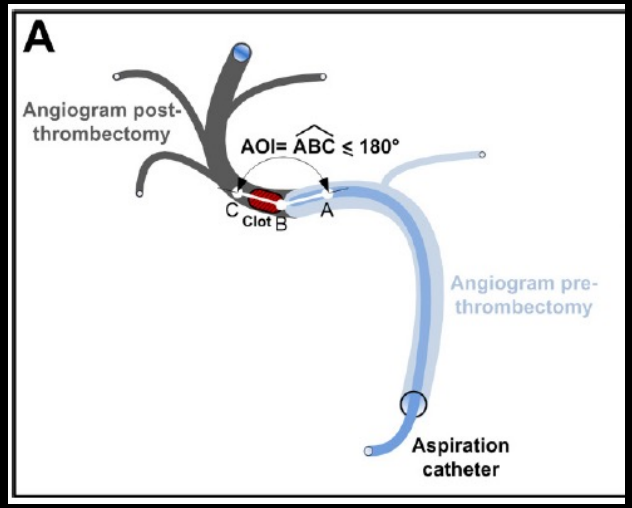
Raphaël Blanc, MD, MSc; Hocine Redjem, MD; Gabriele Ciccio, MD; Stanislas Smajda, MD; Jean-Philippes Desilles, MD; Eliane Orng, PharmD; Guillaume Taylor, MD; Elodie Drumez, BST; Robert Fahed, MD; Julien Labreuche, BST; Mikael Mazighi, MD, PhD; Bertrand Lapergue, MD, PhD; Michel Piotin, MD, PhD

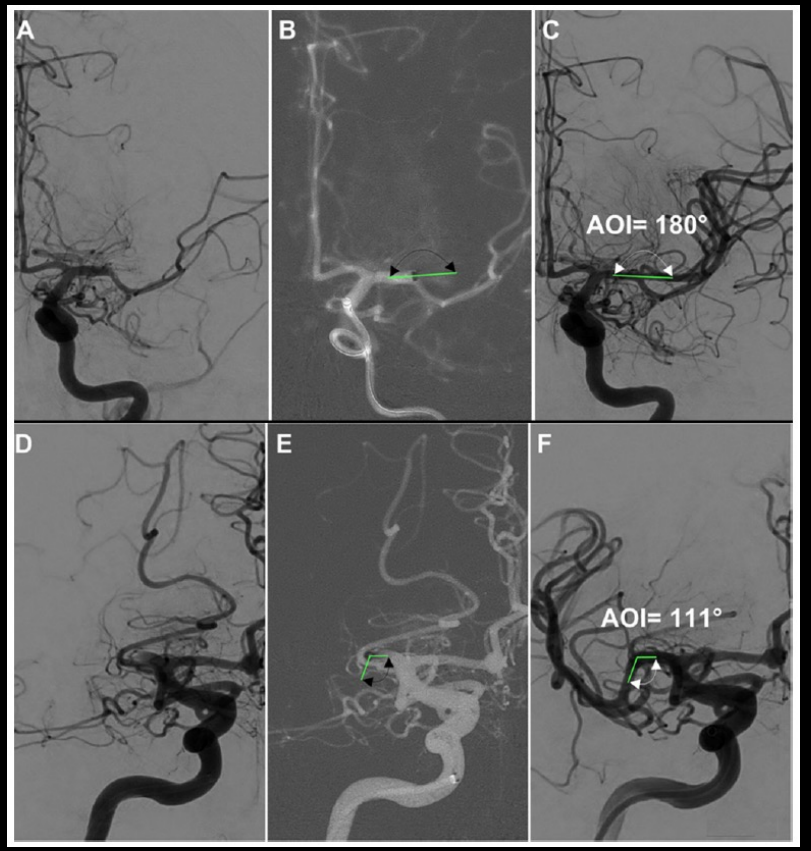
ADAPT - Tips & Tricks
Facteurs anatomiques influençant le succès de l'aspiration

- 1- Angle d'interaction entre le thrombus et le CA

Direct thromboaspiration efficacy for mechanical thrombectomy is related to the angle of interaction between the aspiration catheter and the clot

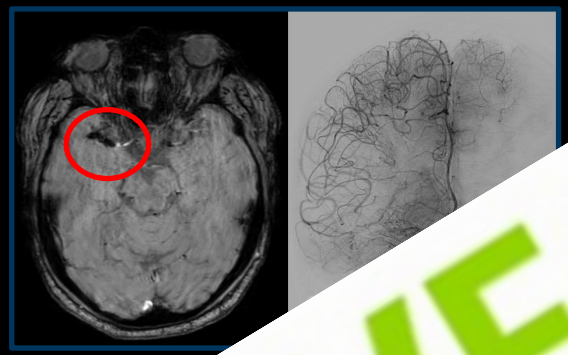
Gianmarco Bernava,[1] Andrea Rosi,[1] José Boto,[1] Olivier Brina,[1] Zsolt Kulcsar,[2] Christoph Czarnetzki,[3] Emmanuel Carrera,[4] Karl Schaller,[5] Karl-Olof Lovblad,[1] Paolo Machi[1]

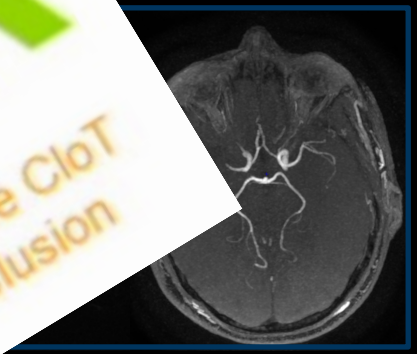




ADAPT - Tips & Tricks

- Composition du thrombus ?

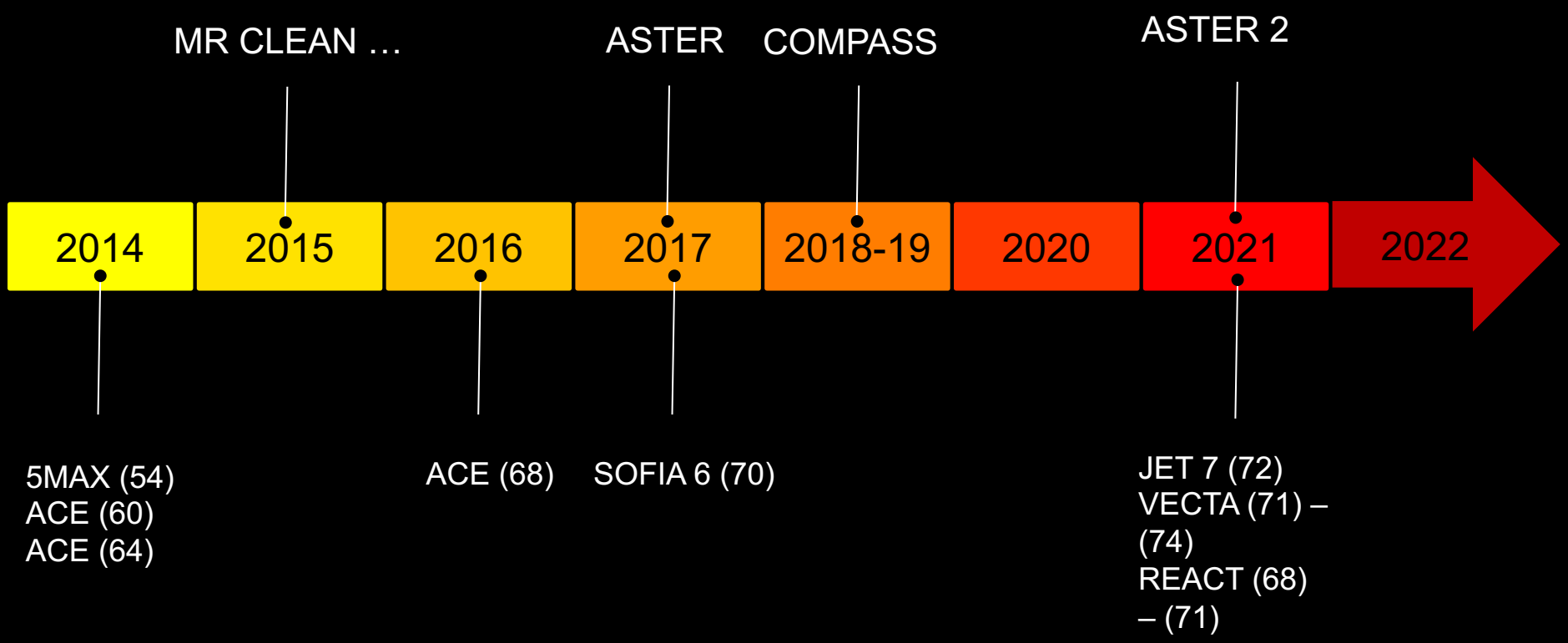




VECTOR

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

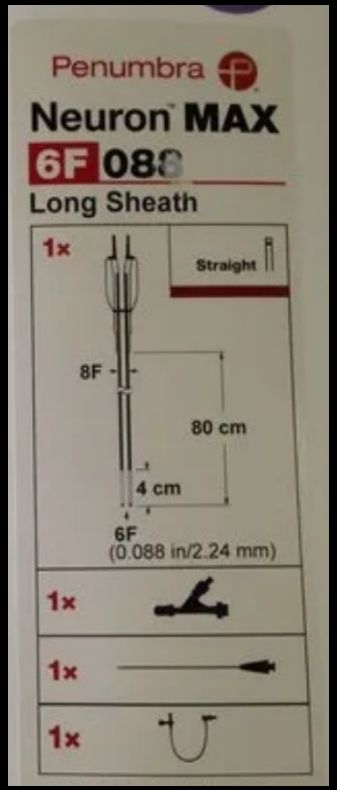
Evolution des catheters d'aspiration
The larger, the better ?



Quel catheter guide pour quel catheter d'aspiration ?

Product name	Lenght (cm)	Proximal OD (inches)	Proximal ID (inches)	Distal ID (inches)	Compatibilité MERCI 9F	CE approved
PENUMBRA (Alameda, CA, USA)						
RED 72	132	0.085	0.072	0.072		X
RED 68	132	0.084	0.068	0.068	?	X
RED 62	138	0.076	0.062	0.062	X	x
STRYKER (Fremont, CA, USA)						
VECTA 74	132	0.087		0.074		X
VECTA 71	132	0.085		0.071	?	X
MICROVENTION (Tustin, CA, USA)						
SOFIA 6F FLOW PLUS	125/131	0.0825	0.070	0.070	X	X
MEDTRONIC (Irvine, CA, USA)						
REACT 68	132	0.083	0.068	0.068	X	X
REACT 71	132	0.0855	0.071	0.071		X

Pour les plus gros catheter d'aspiration
BGC non compatible



Quel micro-catheter ?

Quel micro-catheter ?

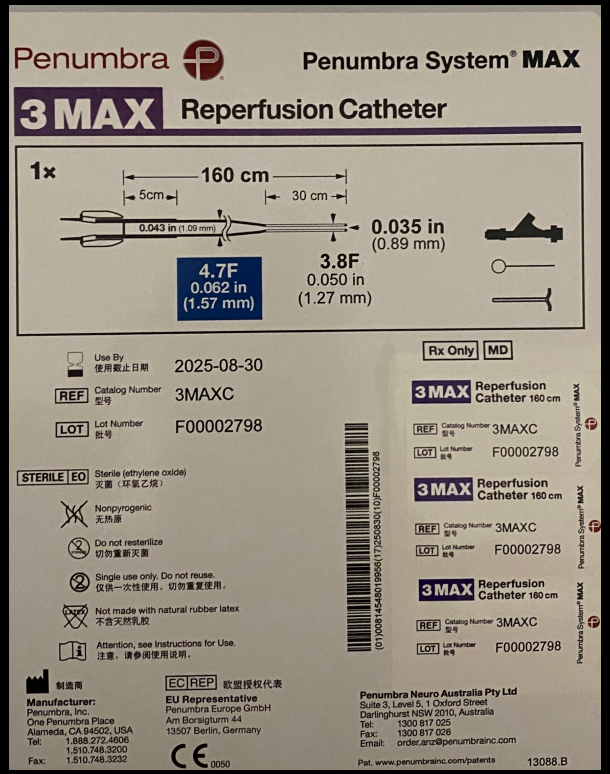
AVANTAGES

- Possibilité de déployer toutes les tailles de stent (de 3 à 6 mm)
- ID de 0.021 in → meilleure navigation distale

LIMITES

- ?

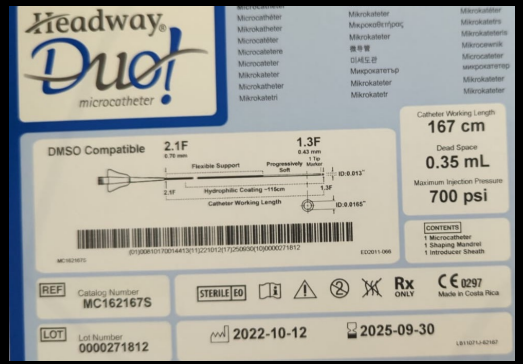
Quel micro-catheter ? Particularité du 3MAX ++



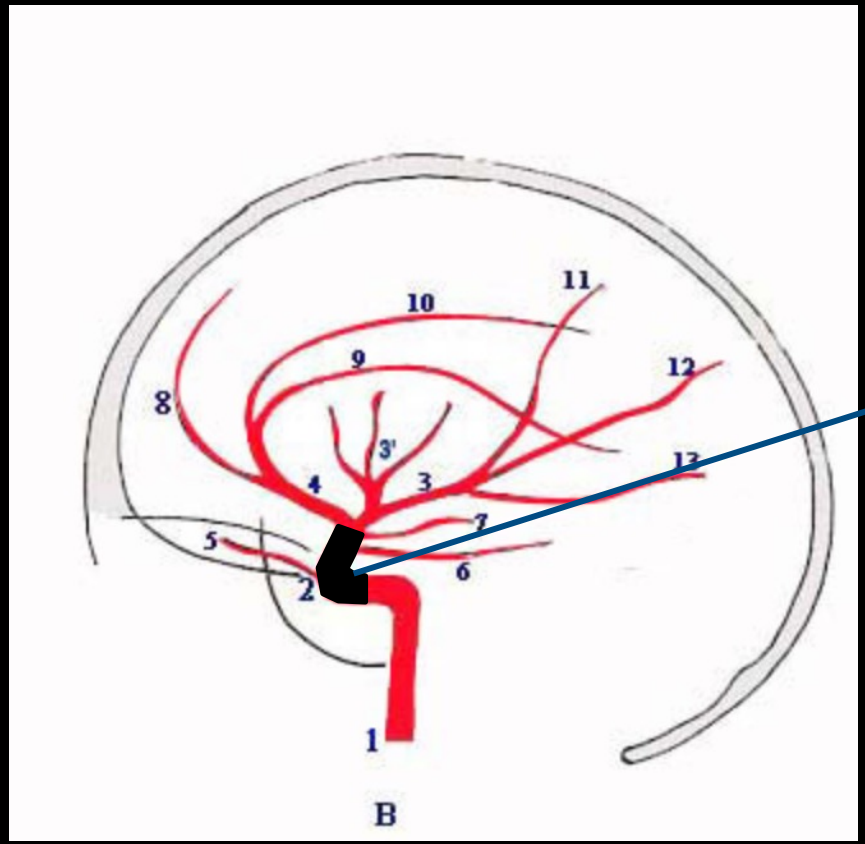
Longueur importante 160 cm

Navigation directement sur un guide 014 ou en utilisant :

- Une valve courte
- Un micro-cathéter Duo long 1 marqueur (167 cm).

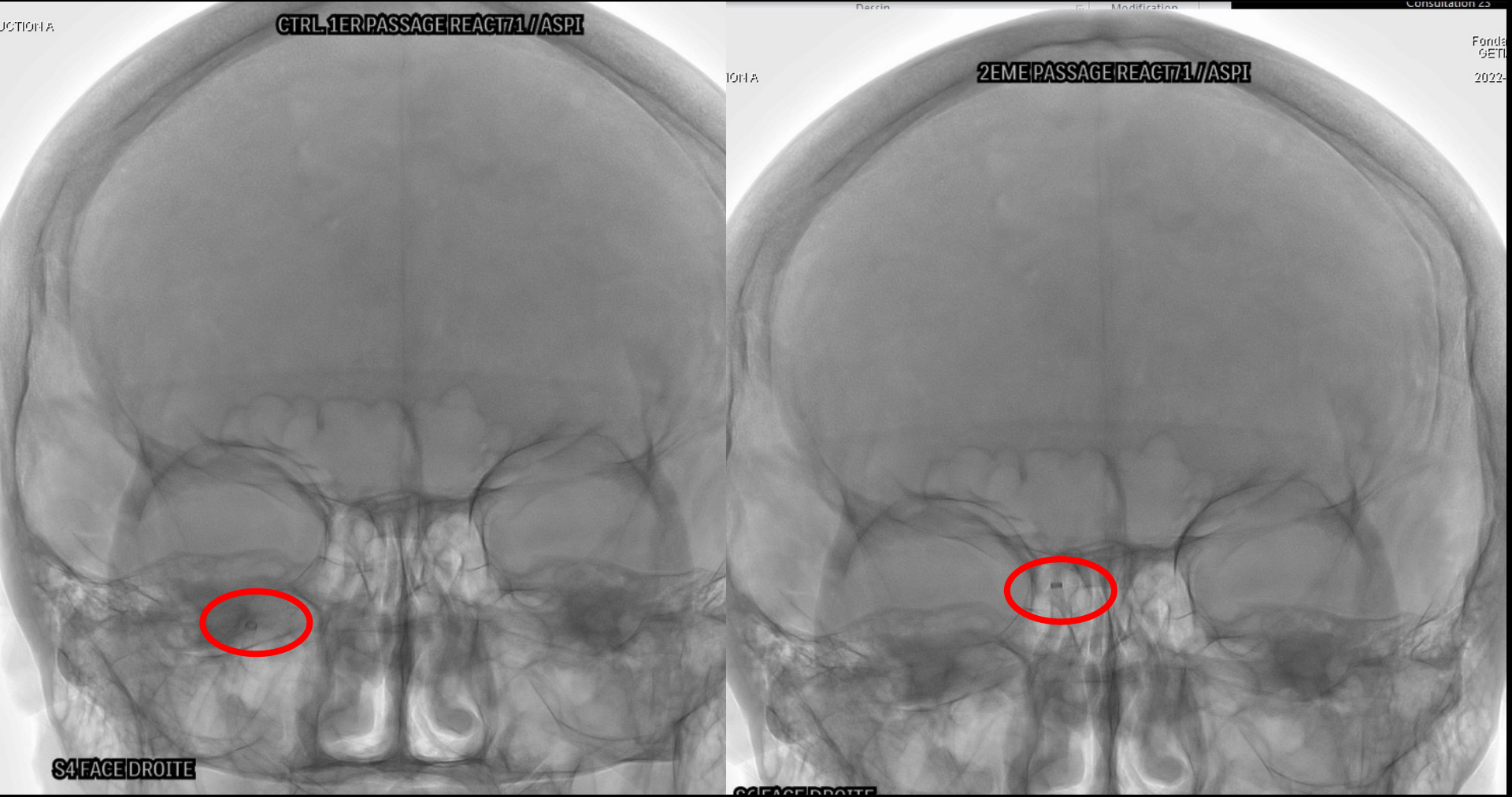


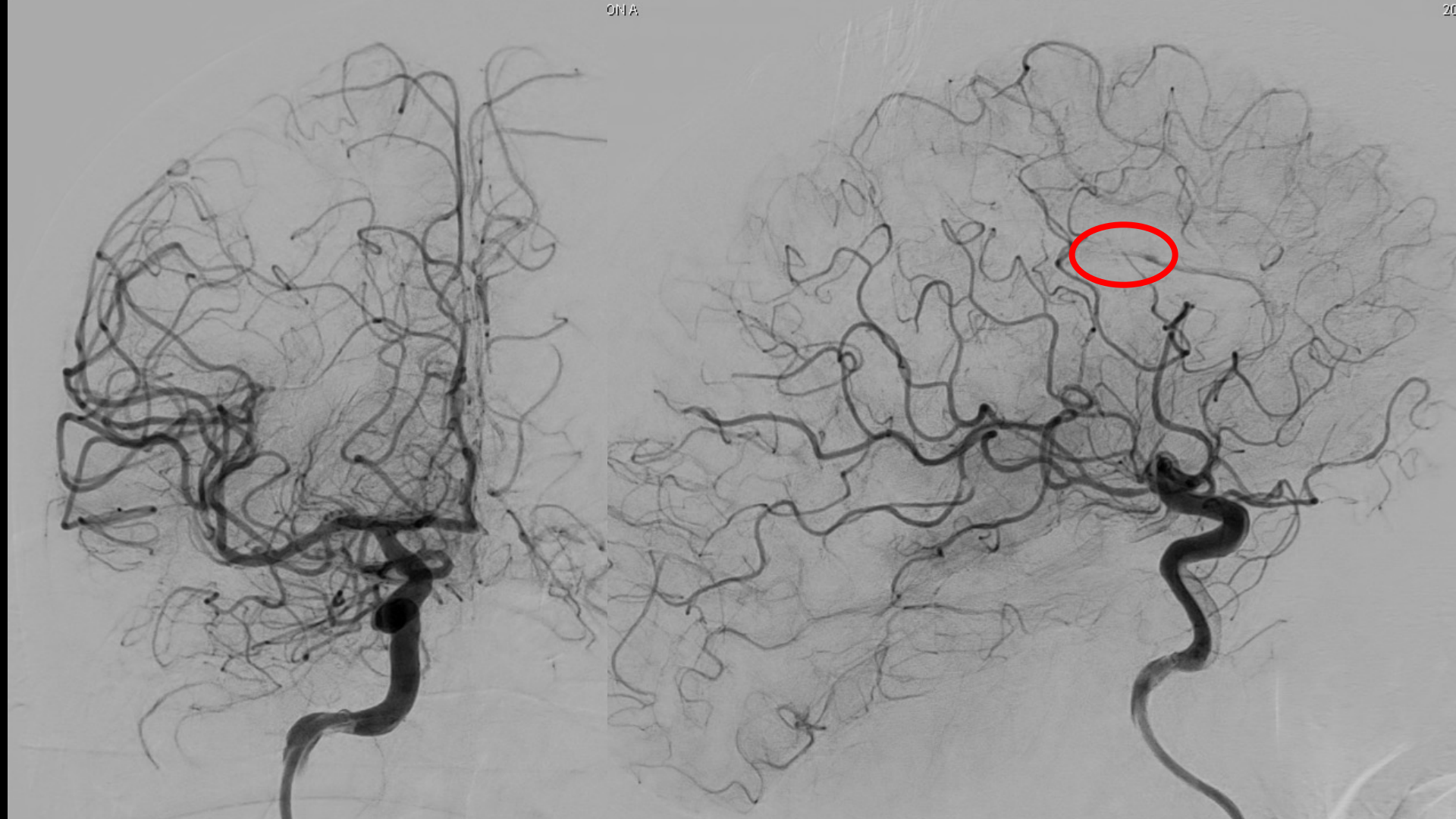
Quel catheter d'aspiration pour quelle occlusion ?



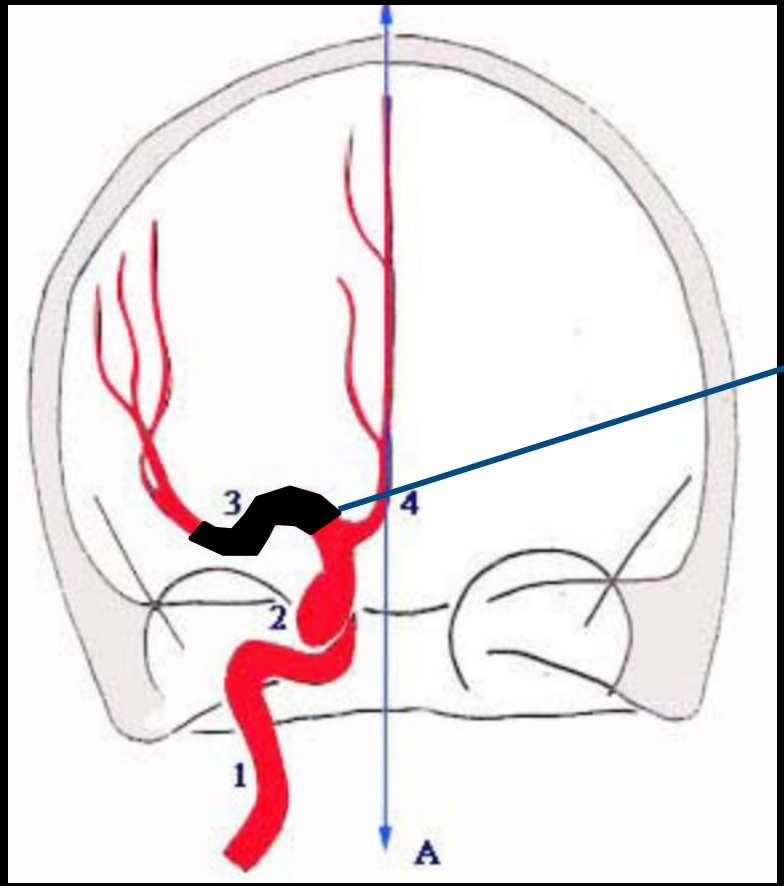
Occlusion Terminaison Carotidienne

REACT 71
RED 72 ou 68
SOFIA 6
VECTA 71 ou 74


CTRL 1ER PASSAGE REACT71 / ASPI
2EME PASSAGE REACT71 / ASPI
S4 FACE DROITE

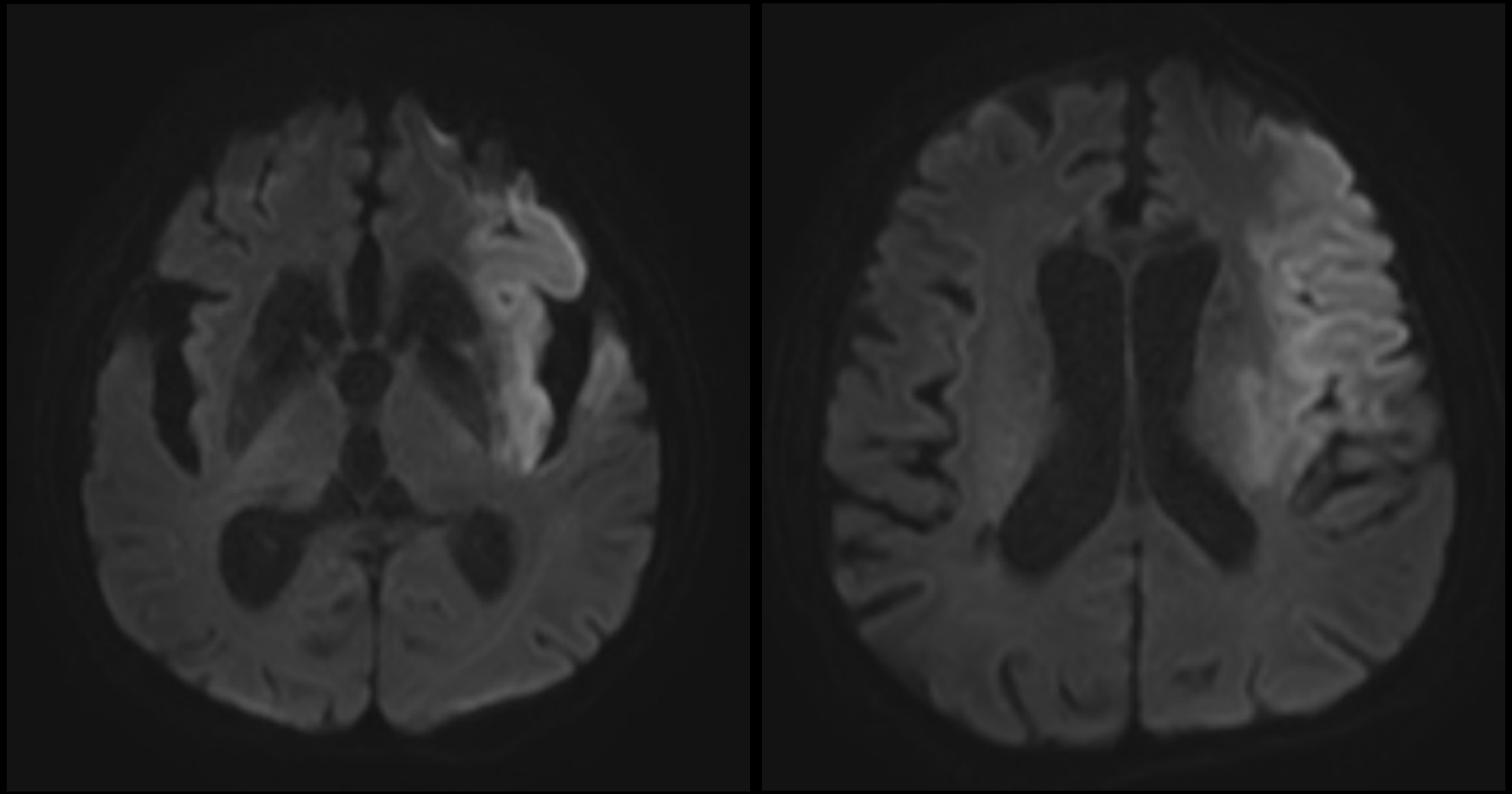

ONA

Quel catheter d'aspiration pour quelle occlusion ?

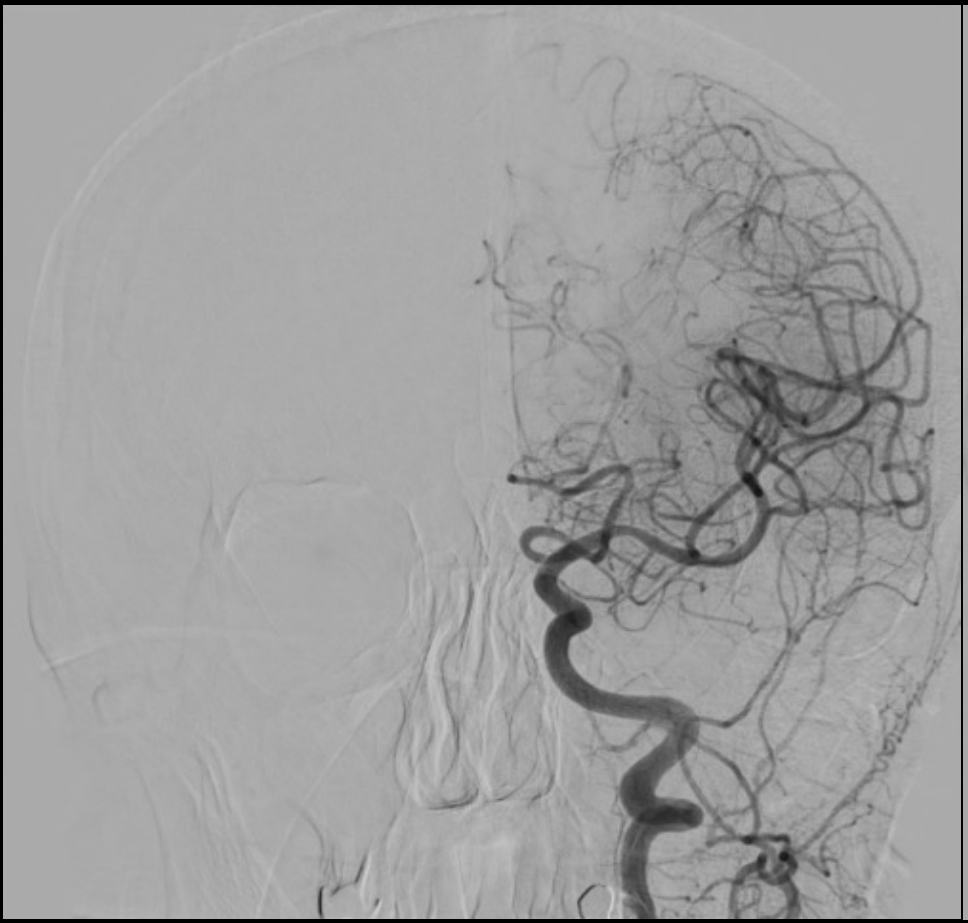
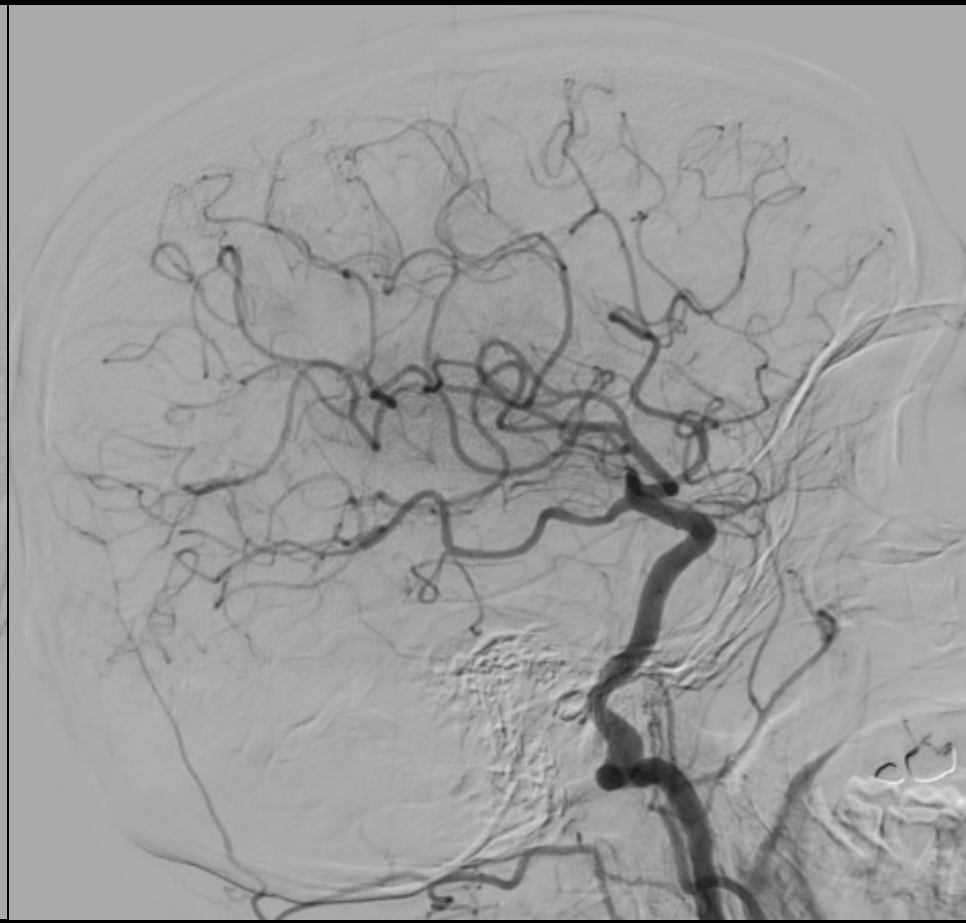


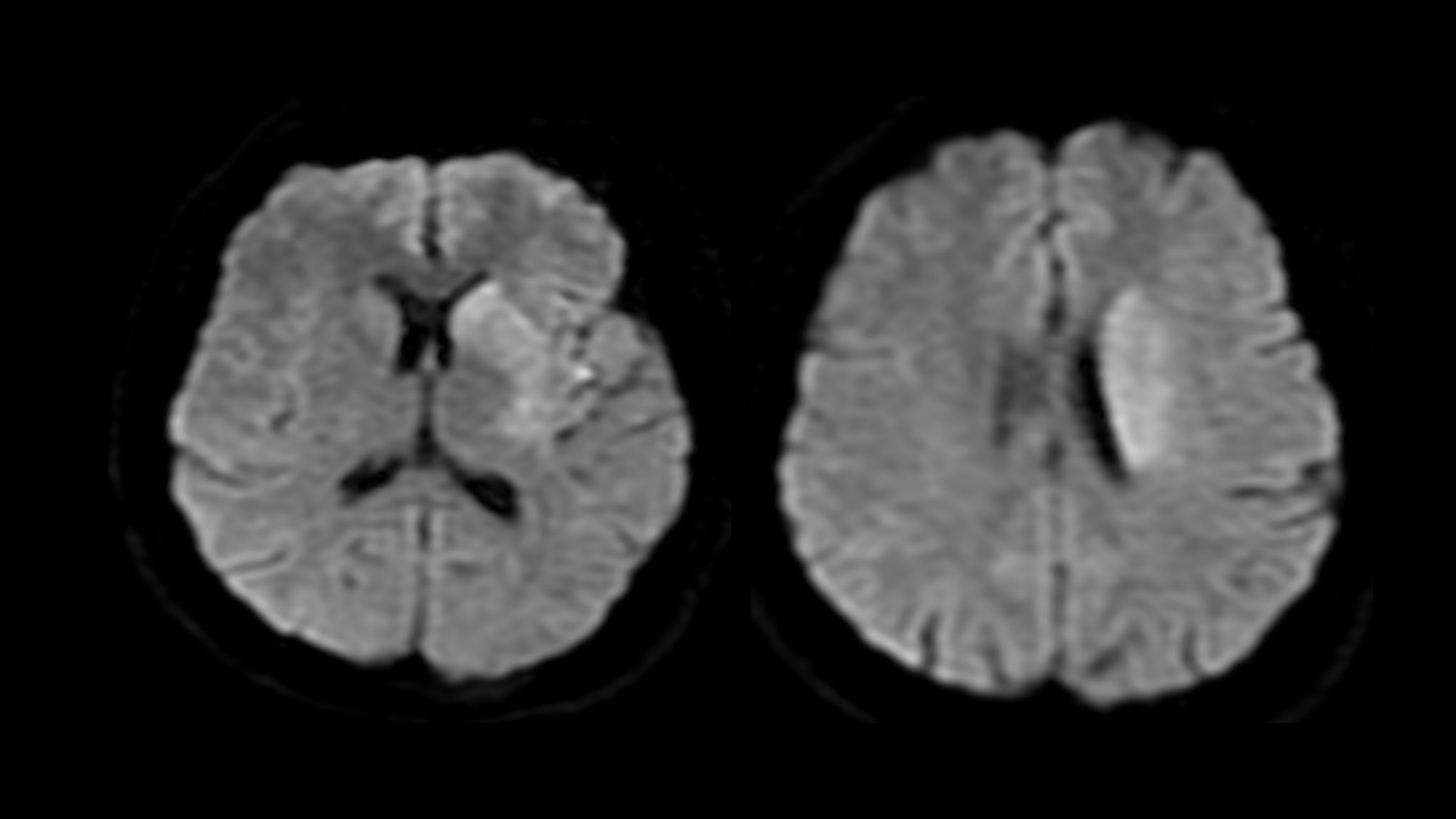
Occlusion M1

SOFIA 6
REACT 71
RED 68
VECTA 71



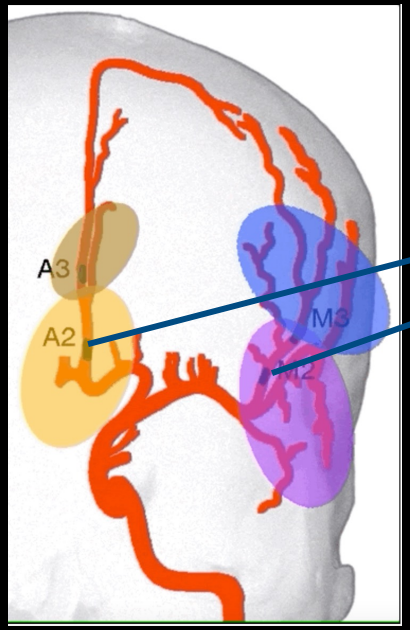

1ER PASSAGE SOFIA6
S10 FACE GAUCHE

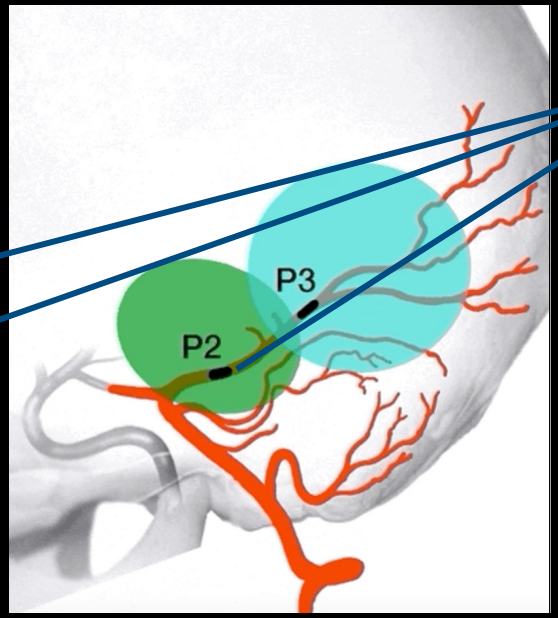






S5 1er PASSAGE RED68

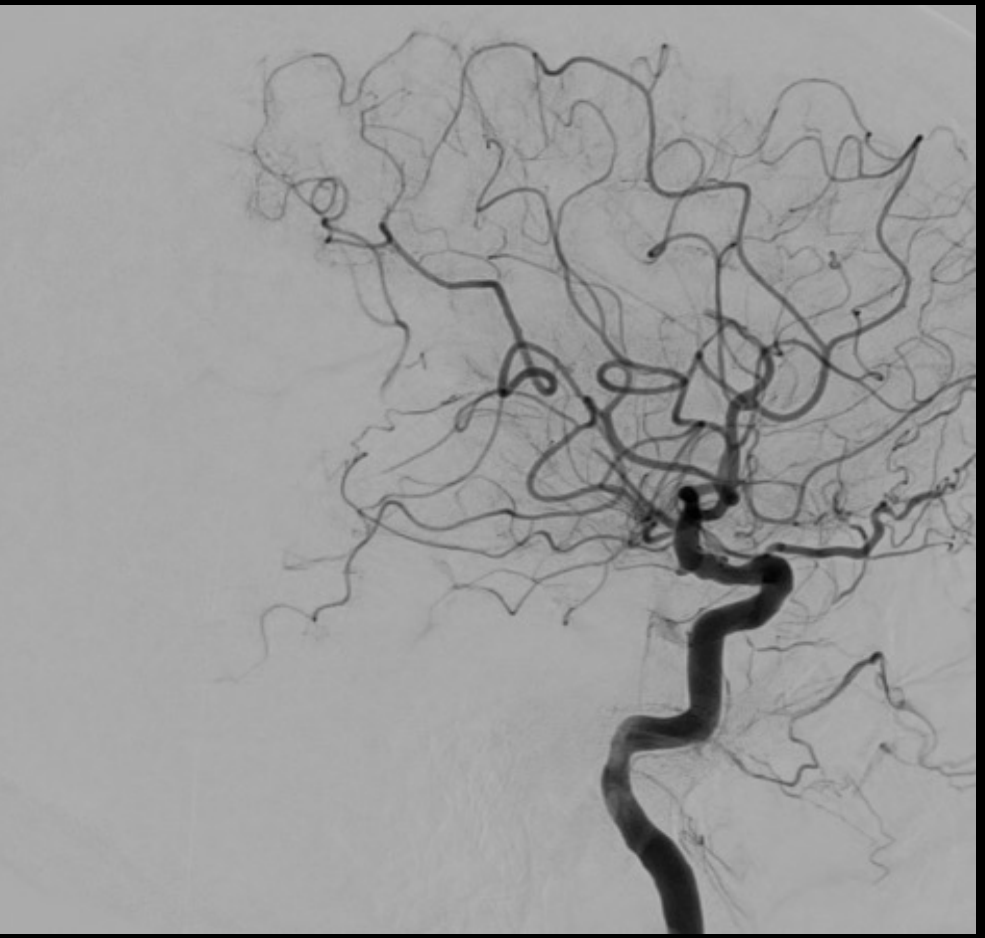
Quel catheter d'aspiration pour quelle occlusion ?

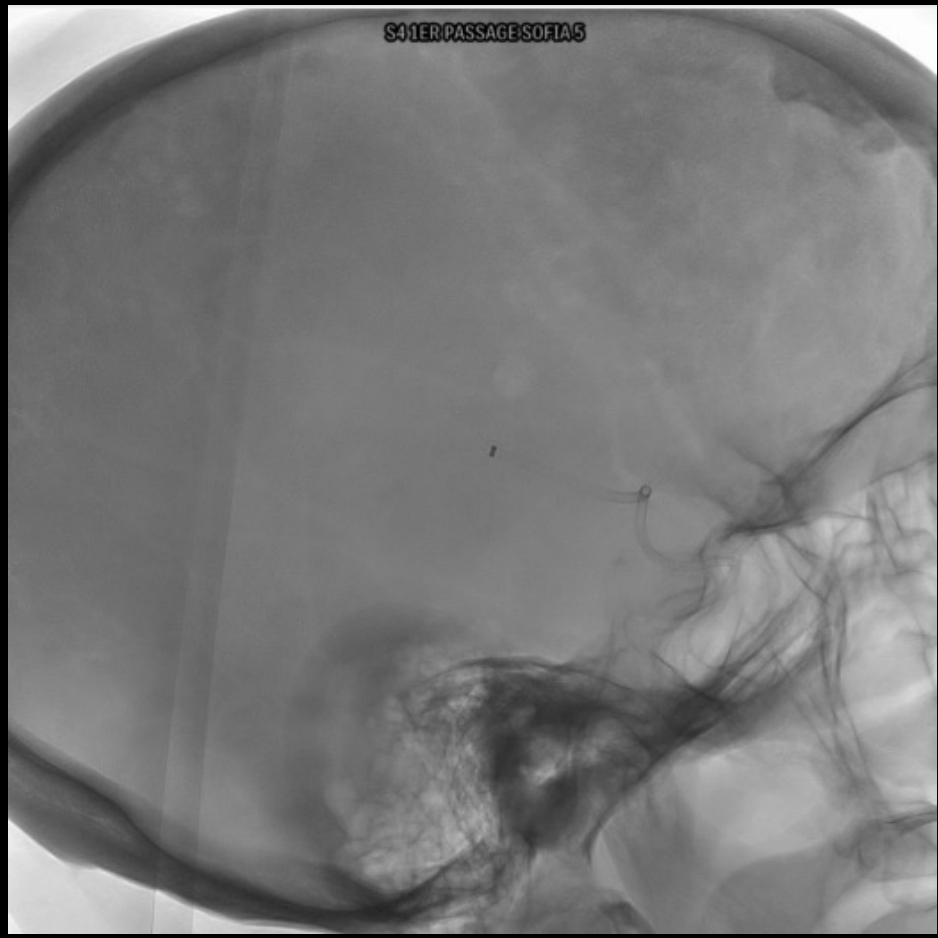


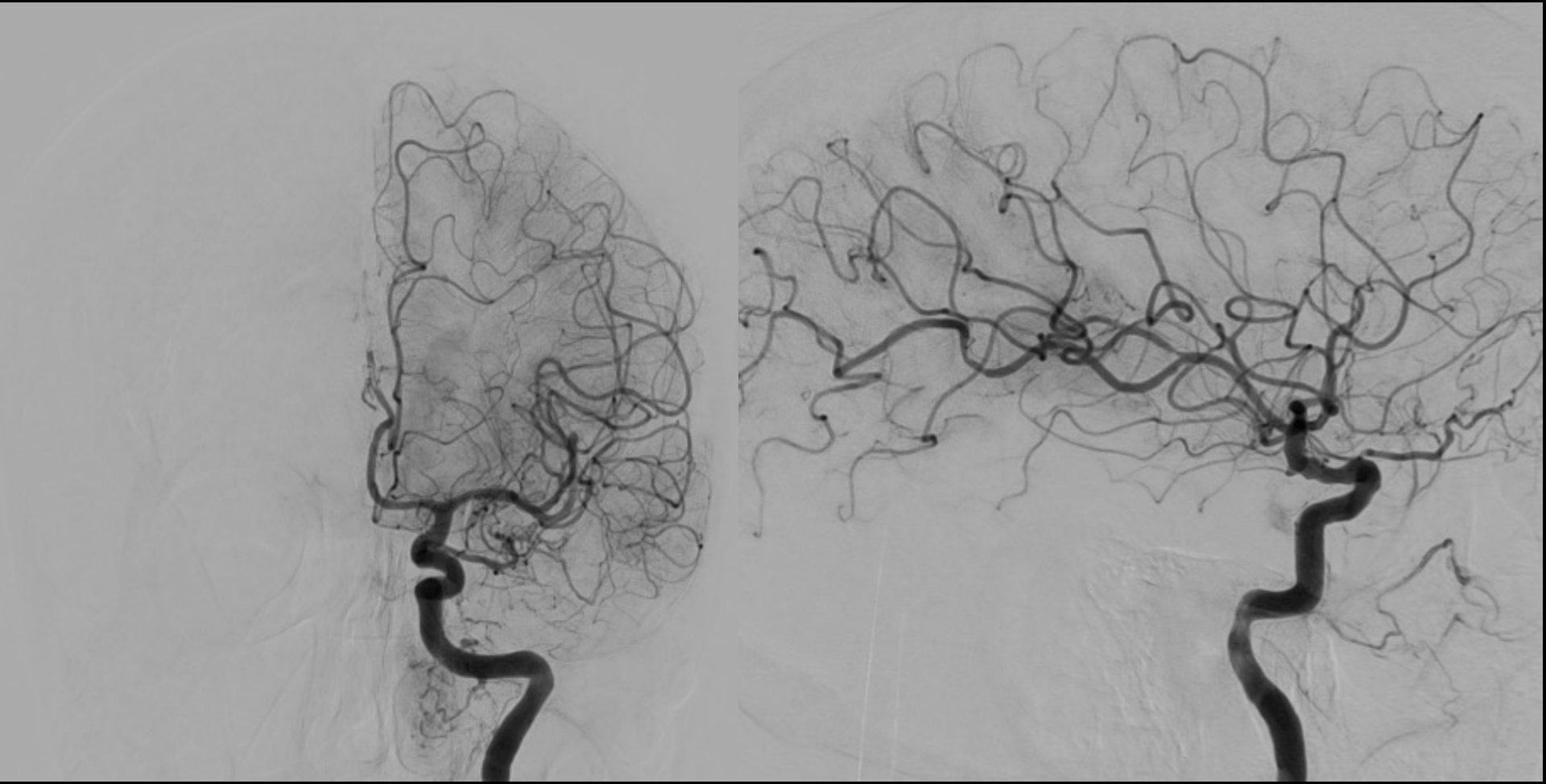


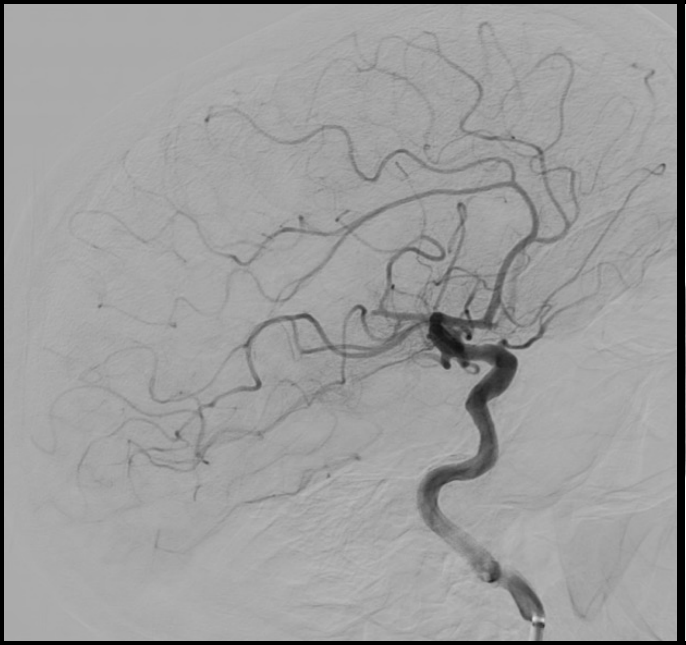
Occlusion M2-A2-P2

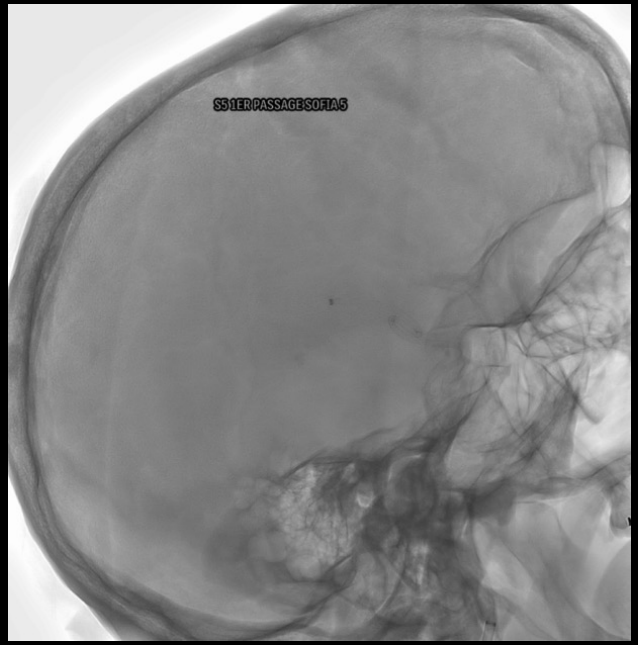
SOFIA 5
RED 62

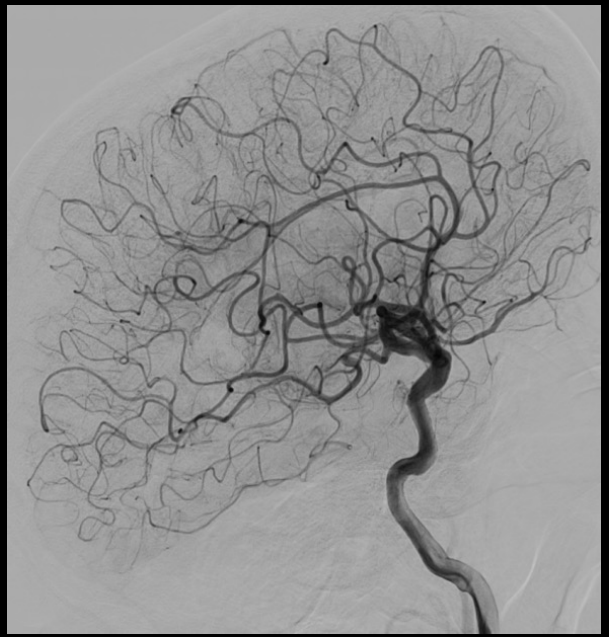



S4 1ER PASSAGE SOFIA 5

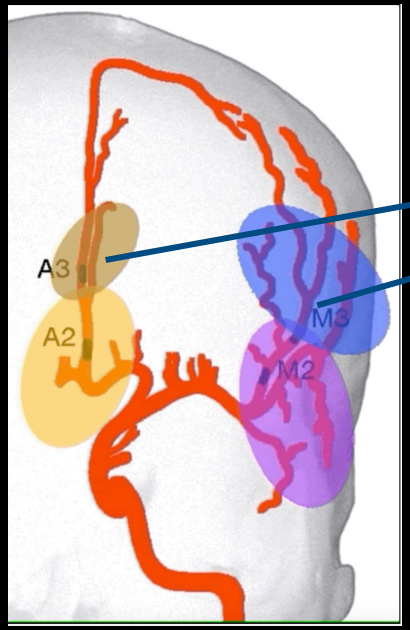


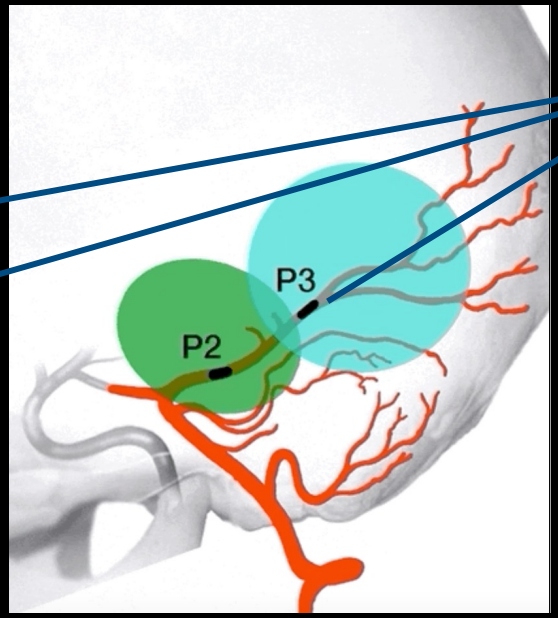



S5 1ER PASSAGE SOFTA 5



Quel catheter d'aspiration pour quelle occlusion ?

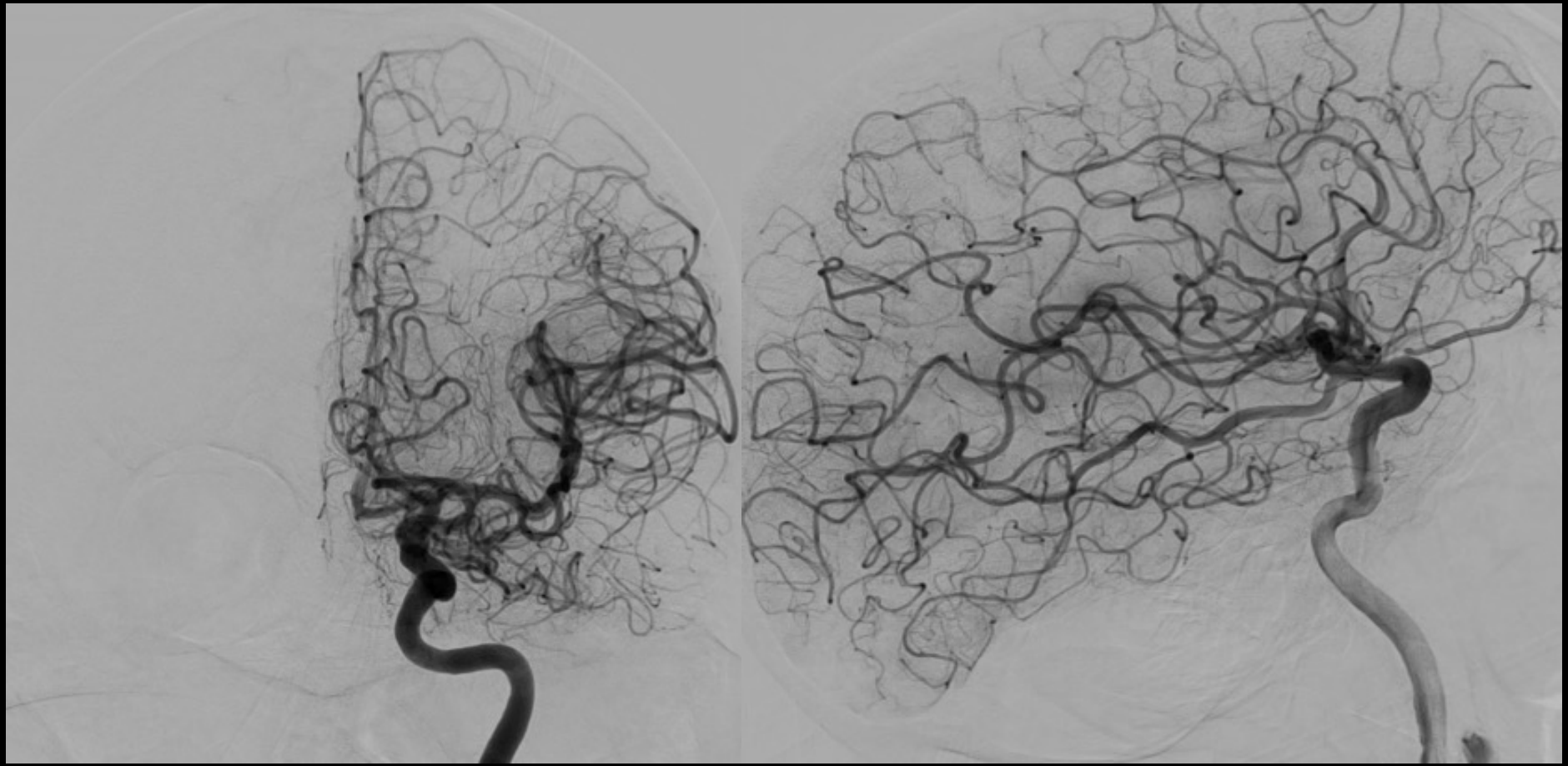




Occlusion M3-A3-P3

3MAX
SOFIA 5
RED 62


5EME PASSAGE 3MAX
S21 PROFIL GAUCHE



Aspiration versus autres techniques dans les occlusions antérieures proximales (ICA, M1)

ADAPT – Comment démontrer que ça marche?

HYPOTHESIS:

ADAPT first line better than Stent Retriever first line

ASTER

JAMA | Original Investigation

Effect of Endovascular Contact Aspiration vs Stent Retriever on Revascularization in Patients With Acute Ischemic Stroke and Large Vessel Occlusion

The ASTER Randomized Clinical Trial

Bertrand Lapergue, MD, PhD; Raphael Blanc, MD, MSc; Benjamin Gory, MD, PhD; Julien Labreuche, BST; Alain Duhamel, PhD; Gautier Marnat, MD; Suzana Saleme, MD; Vincent Costalat, MD, PhD; Serge Bracard, MD; Hubert Desal, MD, PhD; Mikael Mazighi, MD, PhD; Arturo Consoli, MD; Michel Piotin, MD, PhD; for the ASTER Trial Investigators

Design	Prospective, randomized, multicenter, controlled open-label design with blinded outcome evaluation (PROBE)
Population	Patients admitted with suspected ischemic anterior circulation stroke secondary to LVO with onset of symptoms <6 hours
Randomization	➢ Randomized 1:1 to ADAPT or SR ➢ Stratified by center and prior IV thrombolysis.
Rescue	If the assigned treatment technique was not successful after 3 attempts, the procedure was continued with another technique at the operator's discretion.
Sites	8 centers in France
Sample Size	380 patients to detect an absolute difference of 15% in primary outcome ➢ Revascularization rate of 70% in the control (SR) arm ➢ Two-sided test (alpha=5%, power=90%) ➢ Rate of spontaneous recanalization and catheterization failures of 15%

JAMA 2017

ASTER

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Primary	Successful revascularization (mTICI 2b–3) at the end of the treatment
Secondary	➢ Successful revascularization (mTICI 2b–3) after the assigned treatment technique ➢ Procedural times ➢ Need for a rescue technique ➢ Complications ➢ Modified Rankin Scale (mRS) at 3-months

JAMA 2017

ASTER: Results

JAMA | Original Investigation

Effect of Endovascular Contact Aspiration vs Stent Retriever on Revascularization in Patients With Acute Ischemic Stroke and Large Vessel Occlusion

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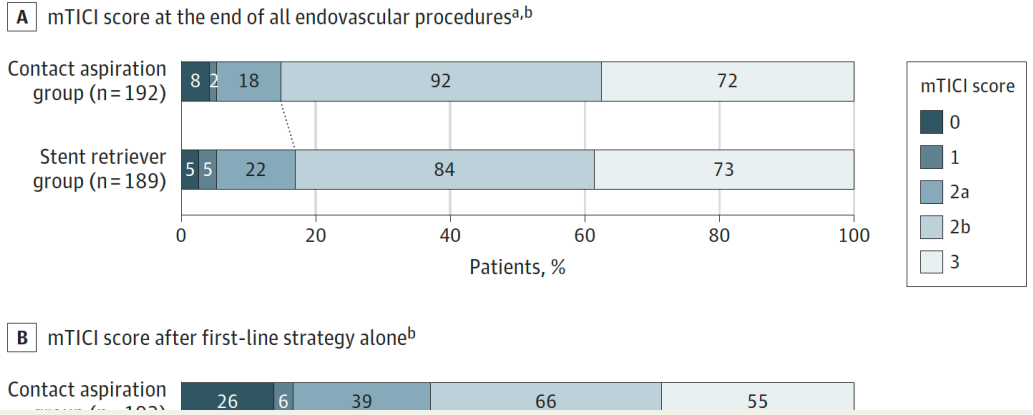
- 1st LineTICI 2b-3
  Aspiration 66%
  ST 55%
- Final Angiogram
  Aspiration 92%
  ST 84%



CONCLUSIONS AND RELEVANCE Among patients with ischemic stroke in the anterior circulation undergoing thrombectomy, first-line thrombectomy with contact aspiration compared with stent retriever did not result in an increased successful revascularization rate at the end of the procedure.

JAMA 2017

COMPASS

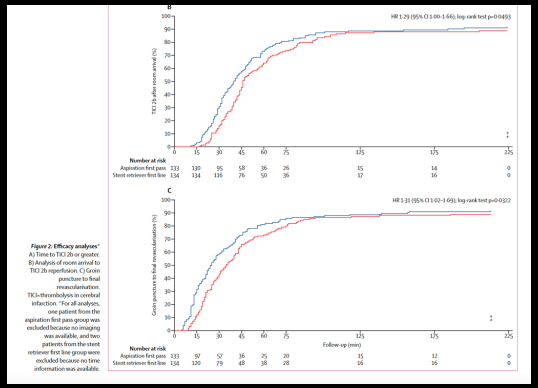


Figure 2: Efficacy analyses*
A) Time to TICI 2b or greater. B) Analysis of room arrival to TICI 2b reperfusion. C) Groin puncture to final revascularisation. TICI=thrombolysis in cerebral infarction. *For all analyses, one patient from the aspiration first pass group was excluded because no imaging was available, and two patients from the stent retriever first line group were excluded because no time information was available.

Aspiration thrombectomy versus stent retriever thrombectomy as first-line approach for large vessel occlusion (COMPASS): a multicentre, randomised, open label, blinded outcome, non-inferiority trial

Aquilla S Turk III, Adnan Siddiqui, Johanna T Fifi, Reade A De Leacy, David J Fiorella, Eugene Gu, Elad I Levy, Kenneth V Snyder, Ricardo A Hanel, Amin Aghaebrahim, B Keith Woodward, Harry R Hixson, Mohammad I Chaudry, Alejandro M Spiotta, Ansaar T Rai, Donald Frei, Josser E Delgado Almandoz, Mike Kelly, Adam Arthur, Blaise Baxter, Joey English, Italo Linfante, Kyle M Fargen, J Mocco

	Aspiration first pass thrombectomy (n=134)	Stent retriever first line thrombectomy (n=136)	Odds ratio (95% CI)	p value
TICI 2b with primary modality	83% (109/131)*	81% (109/134)†	1·14 (0·60–2·14)	0·75
TICI 2b at final assessment	92% (122/133)‡	89% (121/136)	1·37 (0·61–3·11)	0·54
TICI 2c at final assessment	56% (75/133)‡	56% (76/136)	1·02 (0·63–1·65)	1·00
TICI 3 at final assessment	38% (50/133)‡	29% (39/136)	1·50 (0·9–2·5)	0·15

TICI=thrombolysis in cerebral infarction. *Denominator reflects three patients for whom the core lab was unable to assess TICI after primary modality. †Denominator reflects two patients for whom the core lab was unable to assess TICI after primary modality. ‡Denominator reflects one patient with no available procedural imaging to assess.

Table 4: **Angiographic outcomes**

- ADAPT results in non-inferior functional outcomes as compared to a SRFL approach
- Time to reperfusion and quality of reperfusion were comparable
- Cost data: Lower Cost (In US)
- Balloon guide catheter (BGC) use: aspiration arm (34%)/SR arm (45%)

Lancet 2019

ESO Guidelines on Aspiration

- PICO (Population, Intervention, Comparator, Outcome) Questions
- For each question: Systematic review (3 major Database)
- Total 15 Questions
- Q12: Focus on Aspiration and Use of Proximal Balloon GC

European Stroke Organisation (ESO) - European Society for Minimally Invasive Neurological Therapy (ESMINT) Guidelines on Mechanical Thrombectomy in Acute Ischemic Stroke

Guillaume Turc,[1,2,3,4] Pervinder Bhogal,[5] Urs Fischer,[6] Pooja Khatri,[7] Kyriakos Lobotesis,[8] Mikaël Mazighi,[3,9,10,11] Peter D. Schellinger,[12] Danilo Toni,[13] Joost de Vries,[14] Philip White,[15] Jens Fiehler[16]

Expert opinion

Expert opinion on aspiration, stent retriever, and proximal balloon guide catheter

Experts (9/11) believe that ADAPT may be used as standard first-line treatment, followed by stent retriever thrombectomy as rescue therapy if needed.

Additionally,

- We did not reach a majority vote on the proposal that distal aspiration should be used only in combination with a stent retriever (3/11 experts).
- 8/11 experts believe that any mechanical thrombectomy procedure should preferably be performed in conjunction with a proximal balloon guide catheter.

2019

Traitement combiné (CA/SR) versus Stent Retriever

?

ASTER 2

Effect of Thrombectomy With Combined Contact Aspiration and Stent Retriever vs Stent Retriever Alone on Revascularization in Patients With Acute Ischemic Stroke and Large Vessel Occlusion
The ASTER2 Randomized Clinical Trial

Bertrand Lapergue, MD, PhD; Raphaël Blanc, MD; Vincent Costalat, MD, PhD; Hubert Desal, MD, PhD; Susanna Saleme, MD; Laurent Spelle, MD, PhD; Gaultier Marnat, MD; Eimad Shotar, MD; Francois Eugene, MD; Mikael Mazighi, MD, PhD; Emmanuel Houdart, MD, PhD; Arturo Consoli, MD; Georges Rodesch, MD, PhD; Romain Bourcier, MD, PhD; Serge Bracard, MD, PhD; Alain Duhamel, PhD; Maalek Ben Maacha, RN; Delphine Lopez, RN; Nicholas Renaud, RN; Julien Labreuche, MSc; Benjamin Gory, MD, PhD; Michel Piotin, MD, PhD; for the ASTER2 Trial Investigators

Primary objective and assessment criterion	The main hypothesis is to show the superiority of combining the use of contact aspiration with a stent retriever compared to a stent retriever alone in treatment of acute stroke due to proximal arterial occlusion. The primary endpoint is the rate of perfect reperfusion score ate the end of the endovascular procedure.
Secondary objectives	To demonstrate that the combined approach of contact aspiration and a stent retrievers is clinically superior than using a stent retriever alone Safety/cost-effectiveness analysis in both arms.

ASTER 2: Results

Effect of Thrombectomy With Combined Contact Aspiration and Stent Retriever vs Stent Retriever Alone on Revascularization in Patients With Acute Ischemic Stroke and Large Vessel Occlusion
The ASTER2 Randomized Clinical Trial

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Table 3. Primary and Secondary Efficacy Outcomes

First-allocated thrombectomy[a]	Contact aspiration and stent retriever (n = 203)	Stent retriever (n = 202)	Adjusted absolute difference (95% CI)	Adjusted odds ratio (95% CI)	*P* value
Primary efficacy outcome					
Reperfusion (eTICI 2c/3) at end of procedure[a,b]	131 (64.5)	117 (57.9)	6.6 (-3.0 to 16.2)	1.33 (0.88 to 1.99)	.17
Secondary angiographic efficacy outcomes					
Reperfusion outcomes at end of procedure[b]					
eTICI 2b50/2c/3	183 (90.2)	173 (85.6)	5.0 (-1.6 to 11.1)	1.62 (0.86 to 3.04)	.13
eTICI 3	65 (32.0)	56 (27.7)	4.5 (-4.3 to 13.7)	1.24 (0.80 to 1.92)	.32
Reperfusion outcomes after the assigned initial intervention alone[b]					
eTICI 2b50/2c/3	175 (86.2)	146 (72.3)	14.2 (5.8 to 21.8)	2.54 (1.51 to 4.28)	<.001
eTICI 2c/3	121 (59.6)	100 (49.5)	10.3 (0.8 to 20.1)	1.52 (1.02 to 2.27)	.04
eTICI 3	62 (30.5)	50 (24.8)	9.4 (-0.01 to 19.1)	1.35 (0.86 to 2.11)	.18
First-pass effect (eTICI 2c/3 after first pass)	83 (40.9)	68 (33.7)	7.4 (-2.1 to 16.6)	1.38 (0.91 to 2.08)	.12

ASTER 2: Results

Effect of Thrombectomy With Combined Contact Aspiration and Stent Retriever vs Stent Retriever Alone on Revascularization in Patients With Acute Ischemic Stroke and Large Vessel Occlusion
The ASTER2 Randomized Clinical Trial

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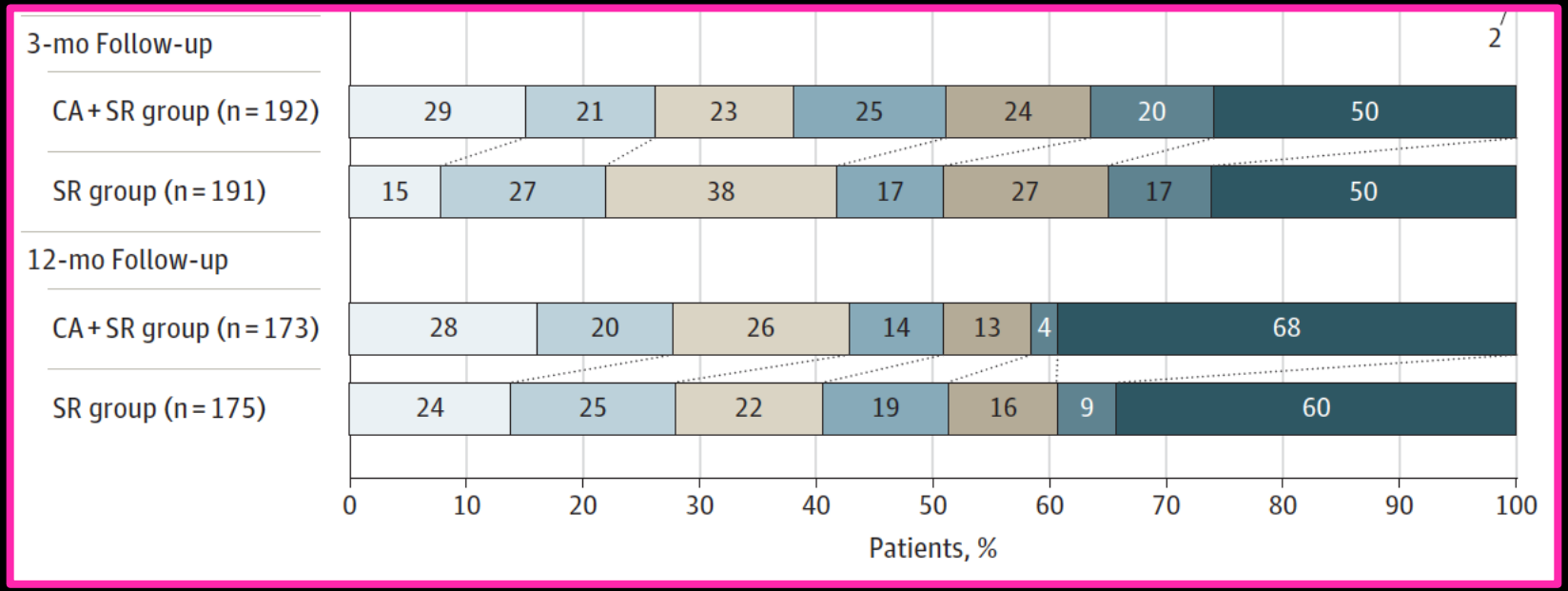


JAMA 2017

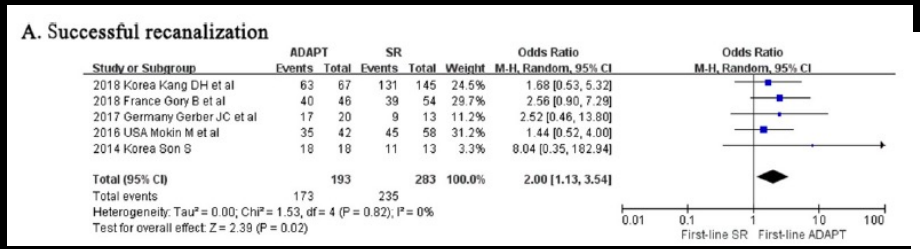
Aspiration versus autres techniques dans les occlusions postérieures (TB, ACP)

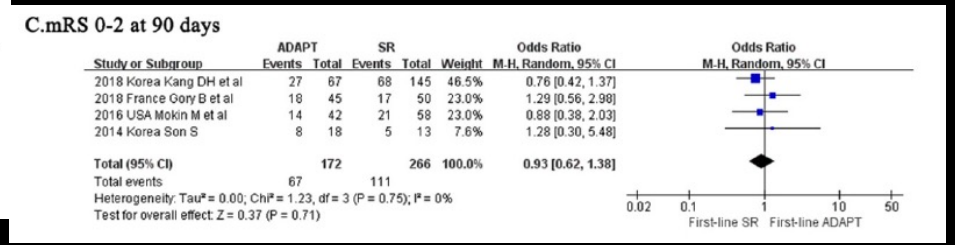
ADAPT versus Stent Retriever

- **Plusieurs études rétrospectives suggèrent une supériorité de l'aspiration comparativement au SR dans les occlusions du TB**
  - Augmentation du taux de TICI 2B et 3
  - Temps de procédure plus court
  - Moins cher +++

Firstline a direct aspiration first pass technique versus firstline stent retriever for acute basilar artery occlusion: a systematic review and meta-analysis

Gengfan Ye,[1,2] Jun Lu,[1] Peng Qi,[1] Xiaoliang Yin,[1,2] Lijun Wang,[1] Daming Wang[1,2]





Etude pc-ASTER à venir +++

Contact Aspiration Versus Stent Retriever for Recanalisation of Acute Stroke Patients With Basilar Artery Occlusion: The Posterior Circulation ASTER Randomized Trial Protocol (pc-ASTER)

ClinicalTrials.gov Identifier: NCT05320263

⚠ The safety and scientific validity of this study is the responsibility of the study sponsor and investigators. Listing a study does not mean it has been evaluated by the U.S. Federal Government. Know the risks and potential benefits of clinical studies and talk to your health care provider before participating. Read our disclaimer for details.

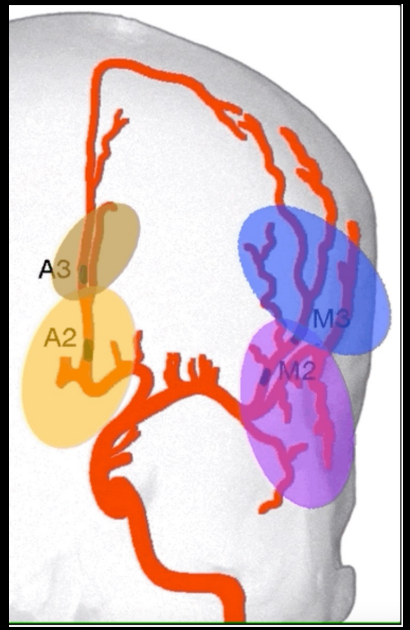
Recruitment Status ⓘ : Not yet recruiting
First Posted ⓘ : April 11, 2022
Last Update Posted ⓘ : April 11, 2022

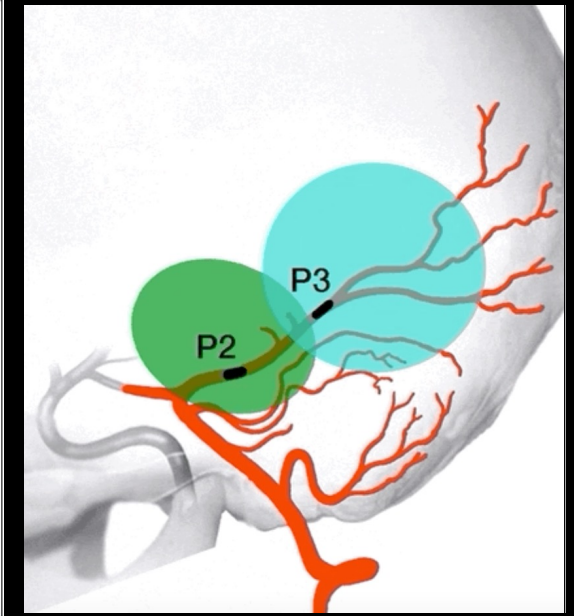
See **Contacts and Locations**

Aspiration versus autres techniques dans les occlusions distales

ADAPT versus Stent Retriever

- Etudes à venir pour valider la thrombectomie dans les occlusions « distales » (ESCAPE MEVO, DISCOUNT)





ADAPT versus Stent Retriever

- **Actuellement, peu d'études comparant les deux stratégies dans ces occlusions distales**

A comparative analysis of 3MAX aspiration versus 3 mm Trevo Retriever for distal occlusion thrombectomy in acute stroke

Diogo C Haussen,[1] Brendan Eby, Alhamza R Al-Bayati,[2] Jonathan A Grossberg,[3] Gabriel Martins Rodrigues, Michael R Frankel,[4,5] Raul G Nogueira

Table 3 Procedural, radiological, and clinical outcomes

	3MAX n=52	3 mm Trevo n=92	P value
Procedure			
Balloon guide catheter	48 (92%)	86 (93%)	0.97
Procedural outcomes			
No of passes (primary device)	1 (1–1)	1 (1–2)	0.46
First-pass mTICI 2b–3	23 (44%)	58 (62%)	**0.03**
First-pass mTICI 3	18 (34%)	40 (43%)	0.37
Adjuvant therapy	16 (31%)	14 (15%)	**0.03**
Final mTICI 2b–3	36 (69%)	78 (84%)	0.05
Final mTICI 3	24 (46%)	54 (58%)	0.22
Imaging outcomes			
Parenchymal hematoma	1 (2%)	6 (6%)	0.22
Subarachnoid hemorrhage	2 (4%)	7 (7%)	0.37
Arterial spasm	17 (32%)	35 (38%)	1.00
Clinical outcomes			
Good outcome	21/45 (46%)	35/78 (45%)	0.85
Mortality	11/45 (24%)	15/79 (19%)	0.49

Stent-retriever alone versus combined use of stent-retriever and contact aspiration technique for middle cerebral artery M2 occlusions: a propensity score analysis

Carlos Pérez-García [1], Santiago Rosati [1], Carlos Gómez-Escalonilla [2], Juan Arrazola [3], Alfonso López-Frías [1], Eva González [4], Jon Fondevila [4], Pedro Vega [5], Eduardo Murias [5], Elvira Jimenez-Gomez [6], Isabel Bravo Rey [6], Juan Macho [7], Luis San Roman [7], Isabel Rodriguez Caamaño [8], Andres Julián Paipa [9], Sebastian Remollo [10], Yeray Aguilar Tejedor [11], Isabel Bermúdez-Coronel [12], Sarai Moliner [13], José Manuel Pumar [14], Saima Bashir [15], Josep Puig [16], Antonio López-Rueda [7], Jordi Blasco [7], Raul G Nogueira [17], Manuel Moreu [1]

Conclusions As front-line modality in M2 occlusions, the SR alone approach results in similar rates of reperfusion and good clinical outcomes to combined SR+CA and might be advantageous due to faster reperfusion times and fewer adverse events.

ADAPT *take Home* Message

- ADAPT Aspiration component

TICI 2b/3 revascularization in 56%-70% of cases

- After failure of Aspiration: other techniques (SR)

TICI 2b/3 revascularization in 80%-95% of cases

- Level1 Evidence of non-inferiority

- Still room for improvement

ADAPT *take Home* Message

- **CA or SR 1ST line equivalent**

– complete reperfusion rate, clinical outcome and adverse events rates in patients with LVO (including M2 segment occlusion).

– New therapeutics trials for new generation of large-bore aspiration catheter

– Rates of near complete recanalization and FPE: primary outcome.

- **Combined approach as a first-line strategy superior?**

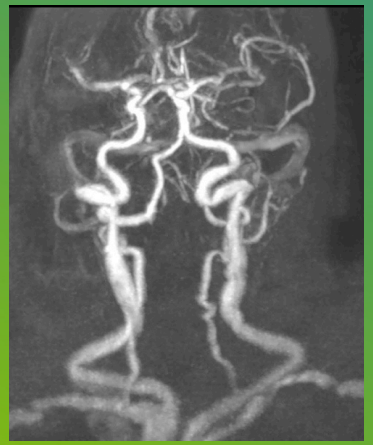
– statistically higher successful and complete reperfusion rates.

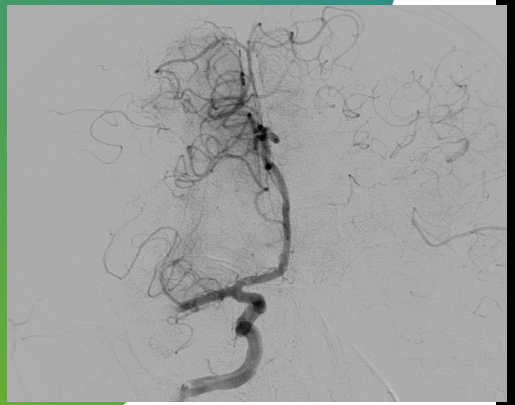
– More data are needed to rule on the potential hemorrhagic risk of combined approach.

Merci

Global Challenges

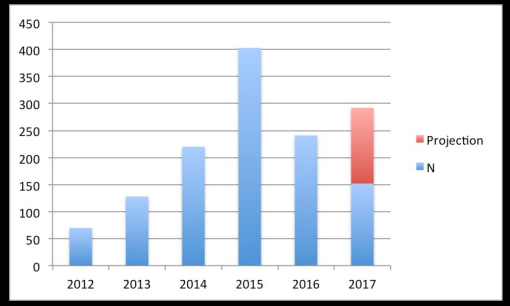
Optimizing procedures to maximize Outcomes





Fondation A. de Rothschild
De l'œil au cerveau

Outcomes


450
400
350
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200
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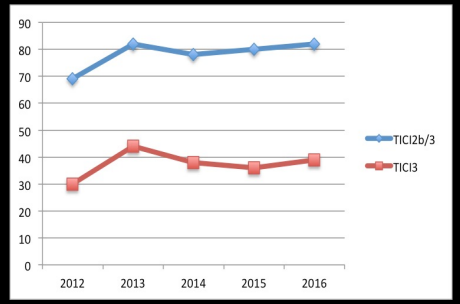
100
50
0
2012
2013
2014
2015
2016
2017
Projection
N


90
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2012
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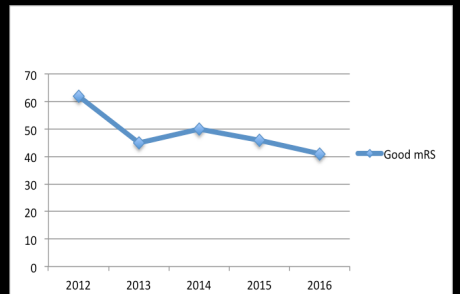
TICI2b/3
TICI3


70
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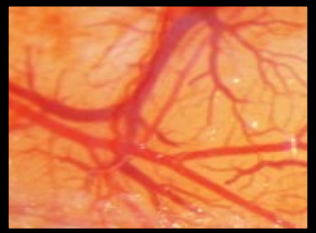
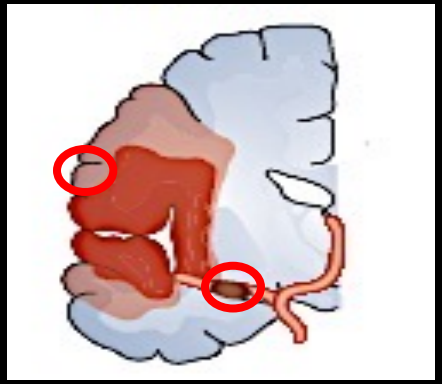
Good mRS

Optimizing procedures to maximize Outcomes

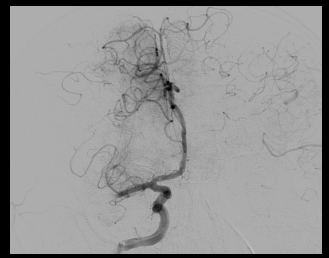




EVT–Failures = Poor Outcomes

1. Procedural failure
- Access failure
- Failure in recanalization or reperfusion
  - (TICI 0-1) (TICI 2a)
  - ENT
  - TICI 3 vs TICI 2b

2. Post procedural failure
- Symptomatic Hemorrage: PH2
- Craniectomy
- TICI 3 and mRS at 3 months > 3



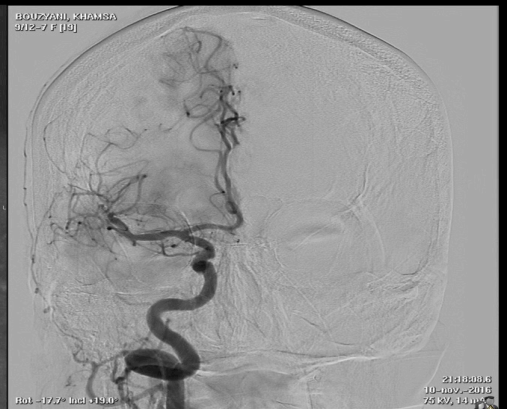
Materials and Methods/Statistical analysis

- Retrospective data base (1058 consecutive treatments from 2012 to 2017)
- Inference Study to evaluate the rate and identify predictive factors of failures

– Access Failure: 15/1058 patients (1,4%)
– Recanalisation Failure TICI 0-1: 84 / 1058 patients (8%)
– Reperfusion Failure TICI 2a: 103 / 1058 patients (9,7%)
– ENT
– Clinical Failure

- Symptomatic Hemorrhage: 4% (Overall HI 30%)
- Craniectomy: 0,2%
- Outcome: mRS >3 despite perfect reperfusion (11,9%)

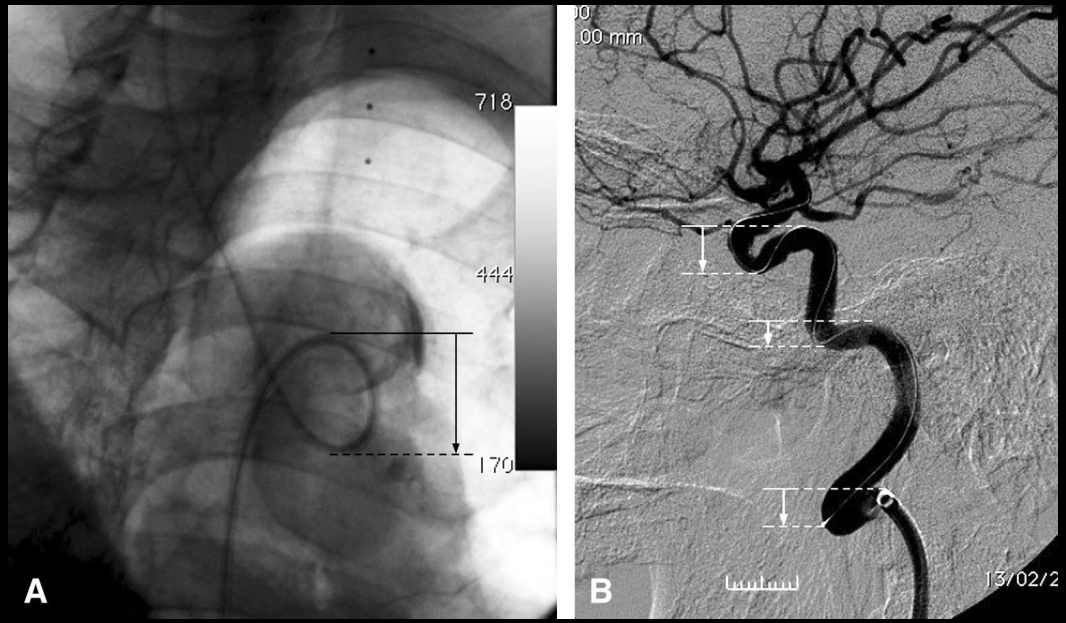
Access Failures Arterial / aortic cross tortuosity



Factors

Number of reverse curves: Inversion of the direction of the arterial vectors

Aortic arch to intracranial level



Arch Classification

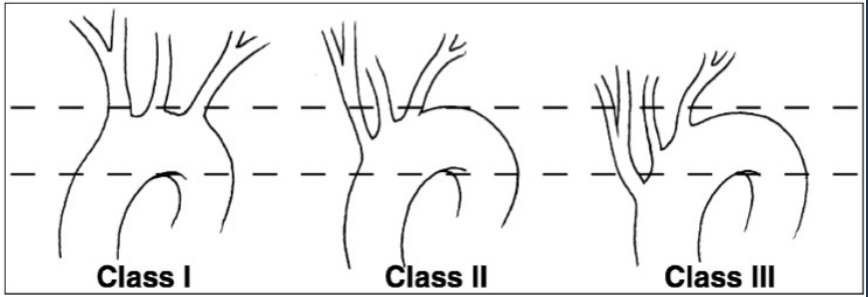
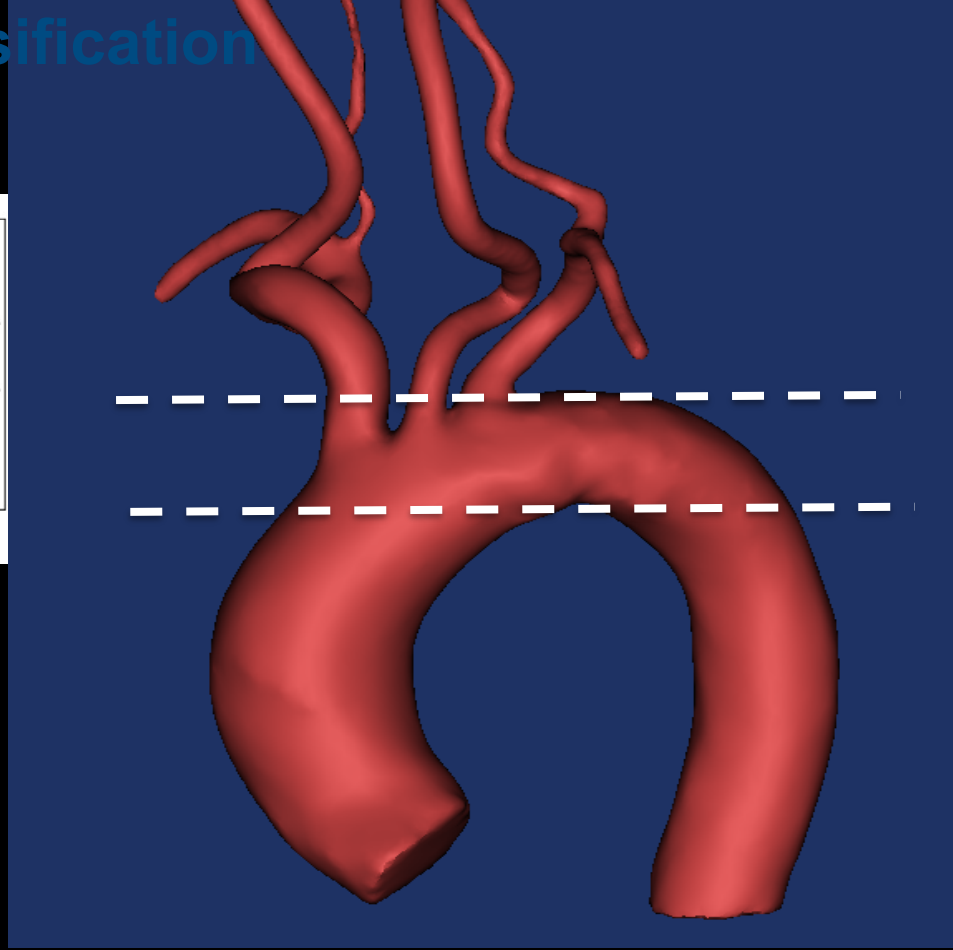


Fig. 1.4 Aortic arch elongation classification scheme.

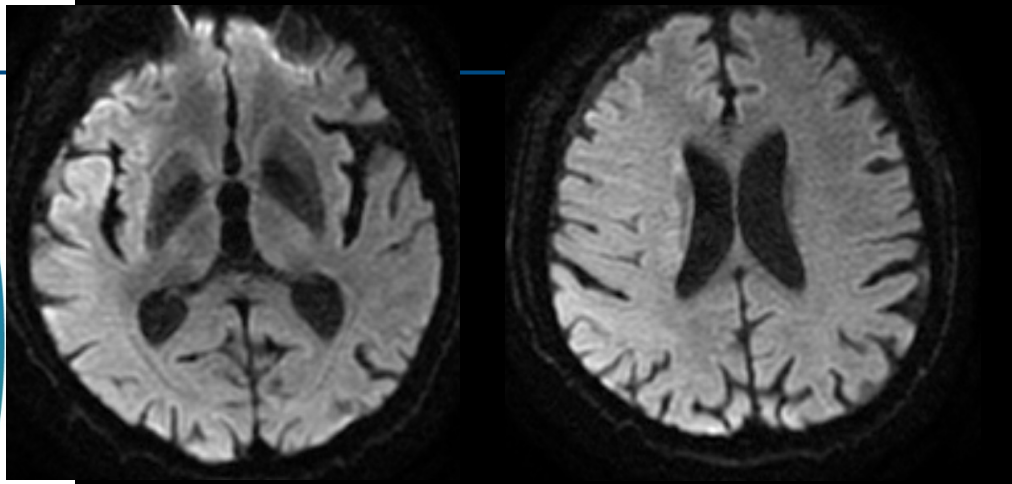


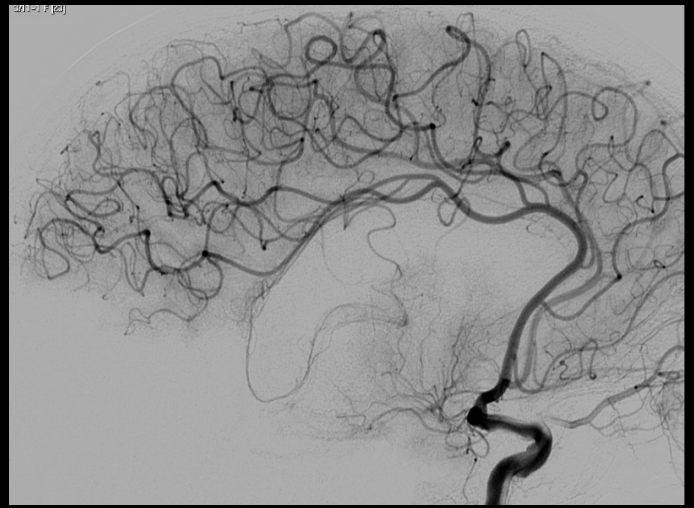
Access Failures

- **15/1058 patients (1,4%)**
  - Mean Age 75 y
- **Several causes :**
  - Arterial / Aortic cross tortuosity : 9/15 (60%)
  - Atheromatous disease :
    - Internal carotid occlusion (3/15) (20%)
    - Femoral/aortic occlusion (1/15)
  - Dissection :
    - Internal carotid occlusion (1/15)
    - Aortic dissection (1/15)
- **25% Patients Time from FP- Clot contact >40 min**
- **In case of failure: Clinical Evolution: 80% mRS >2**

Improving Outcomes: Alternative techniques

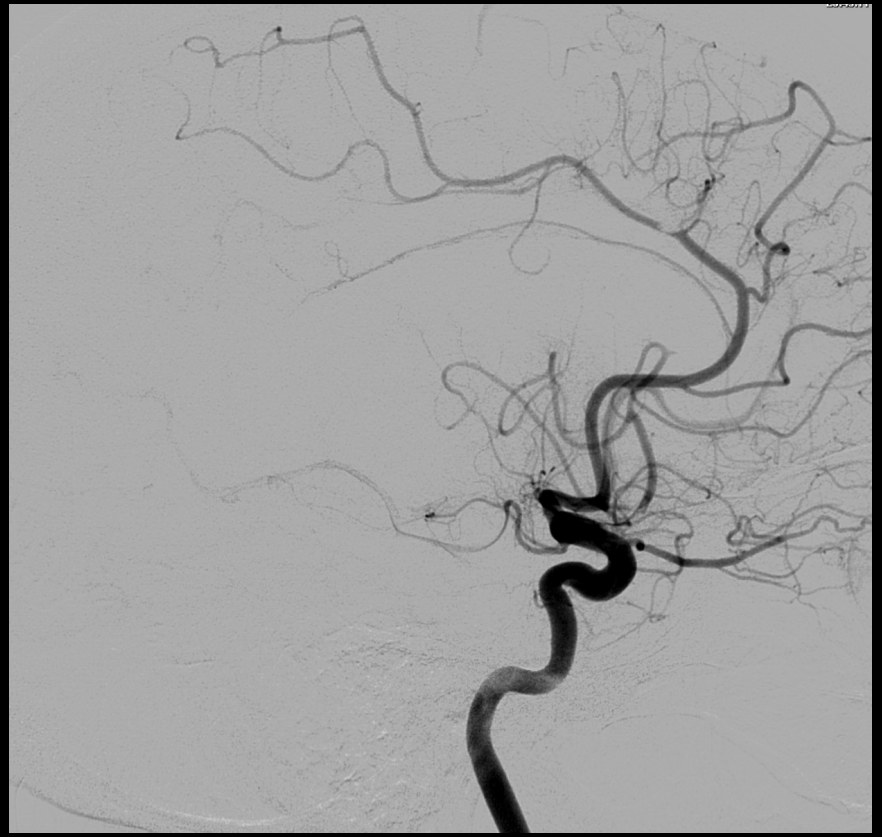
- **Direct Carotid puncture**
- **Radial Approaches**
- **Techniques:**
  - Buddy wire
  - Anchoring loop
  - Microcatheters
- **Dedicated Catheters**
  - Shape
  - Conformability
  - Actuable Catheters





64 yo M
NIHSS

Final Control 10 passes: TICI 0 Reca



Recanalization failure (TICI 0 and 1)

- 84 / 1058 patients (8%)
- Predictive factors:

– Quantitative variables associated :

- Time metrics: Delay Symptom onset-FP, procedural time (Csq)

– Qualitative variables associated :

- DWI Aspects<8, no IVT, ICA occlusion, a poor collateral score

Reperfusion failure (TICI 2a)

- 103 / 1058 patients (9,7%)
- Predictive factors:

– Quantitative variables associated :

- Time metrics: procedural time

– Qualitative variables associated :

- DWI Aspects<8, no IVT, Tandem occlusion, The presence of a complication: Especially Embolic complication in New or Same territory

ENT

- ACA embolisation 65 / 690 patients (9,4%) (Dr Chalumeau MD Thesis)
- IMS III: 12.6%, Mr CLEAN: 8.6%
- Aster: Aspiration arm: 3.6% vs ST arm: 2.6% (ns)
- Predictive factors:
  - Quantitative variables associated :
    - Higher number of passes
  - Qualitative variables associated :
    - Tandem occlusion (19.3%) and ICA (15.3%) vs MCA (4.9%)
    - ASPECTS<7, non cardio-embolic origin, Use of SR alone

Prevent ENT - TICI 3

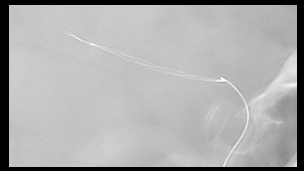
- **Prevent the risk of ENT**

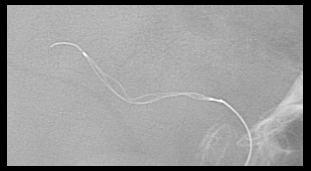
– Proximal balloon occlusion (+ ST or Aspiration)

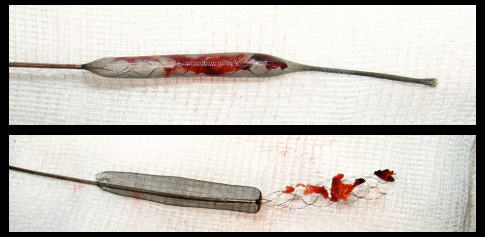
– Coverage system for stentriever to reduce distal emboli (Cover)

– ST with greater incorporation of clot (TigerTriever)

– Larger Bore Catheters







Improving Outcomes TICI 3

- Complete recanalization (TICI 3) leads to better outcomes that sub-complete recanalization (TICI 2b)

– SAVE
– Larger Bore Catheter
– ASTER 2 trial comparing Proximal balloon occlusion + ADAPT versus proximal balloon occlusion + stentriever