

# TICI 2b, 2c ou 3

## Quand faut-il s'arrêter

Dr Abderrahim ZERROUG

Praticien hospitalier

Unité de neuroradiologie, Service de radiologie

CHU Gabriel Montpied

# Généralités

- Thérapie de recanalisation de référence pour les occlusions artérielles proximales

## AHA/ASA Guideline

### 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

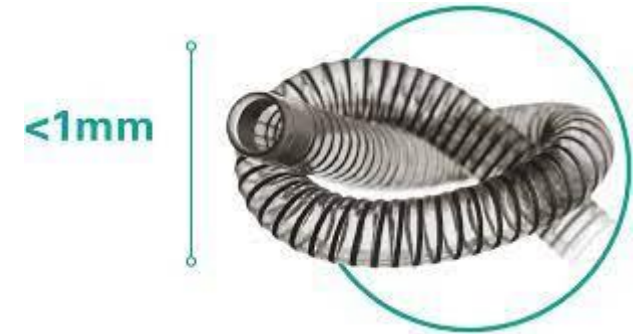
3.7. Mechanical Thrombectomy (Continued)	COR	LOE	New, Revised, or Unchanged
3. Patients should receive mechanical thrombectomy with a stent retriever if they meet all the following criteria: (1) prestroke mRS score of 0 to 1; (2) causative occlusion of the internal carotid artery or MCA segment 1 (M1); (3) age $\geq 18$ years; (4) NIHSS score of $\geq 6$ ; (5) ASPECTS of $\geq 6$ ; and (6) treatment can be initiated (groin puncture) within 6 hours of symptom onset.	I	A	Recommendation revised from 2015 Endovascular.

# Généralités

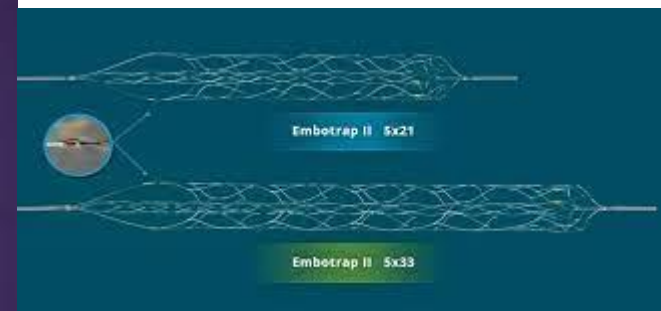
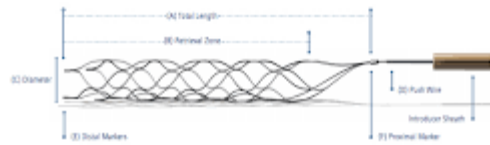
- Thérapie de recanalisation de référence pour les occlusions proximale
- Taux de recanalisation 80 % (75% - 90%)

# Généralités

- Thérapie de recanalisation de référence pour les occlusions proximale
- Taux de recanalisation 80 % (75% - 90%)



Medtronic



ordering information

Product	Part Number	Quantity	Price
Embotrap II 5x21	...	...	...
Embotrap II 5x33	...	...	...

catch+  
www.catchplus.com

The Catch+ logo, featuring a stylized white mesh structure on a dark background.

# Généralités

- Thérapie de recanalisation de référence pour les occlusions proximale
- Taux de recanalisation 80 %
- Taux d'évolution clinique favorable <50%
  - Mauvaise sélection des patients ?
  - Délai de prise en charge
  - Facteurs liés à la procédure ? Durée, nbr de passages, TICI 2b 2c ou 3

# Critères de réussite technique

- TICI
- Nombre de passages
- Complications

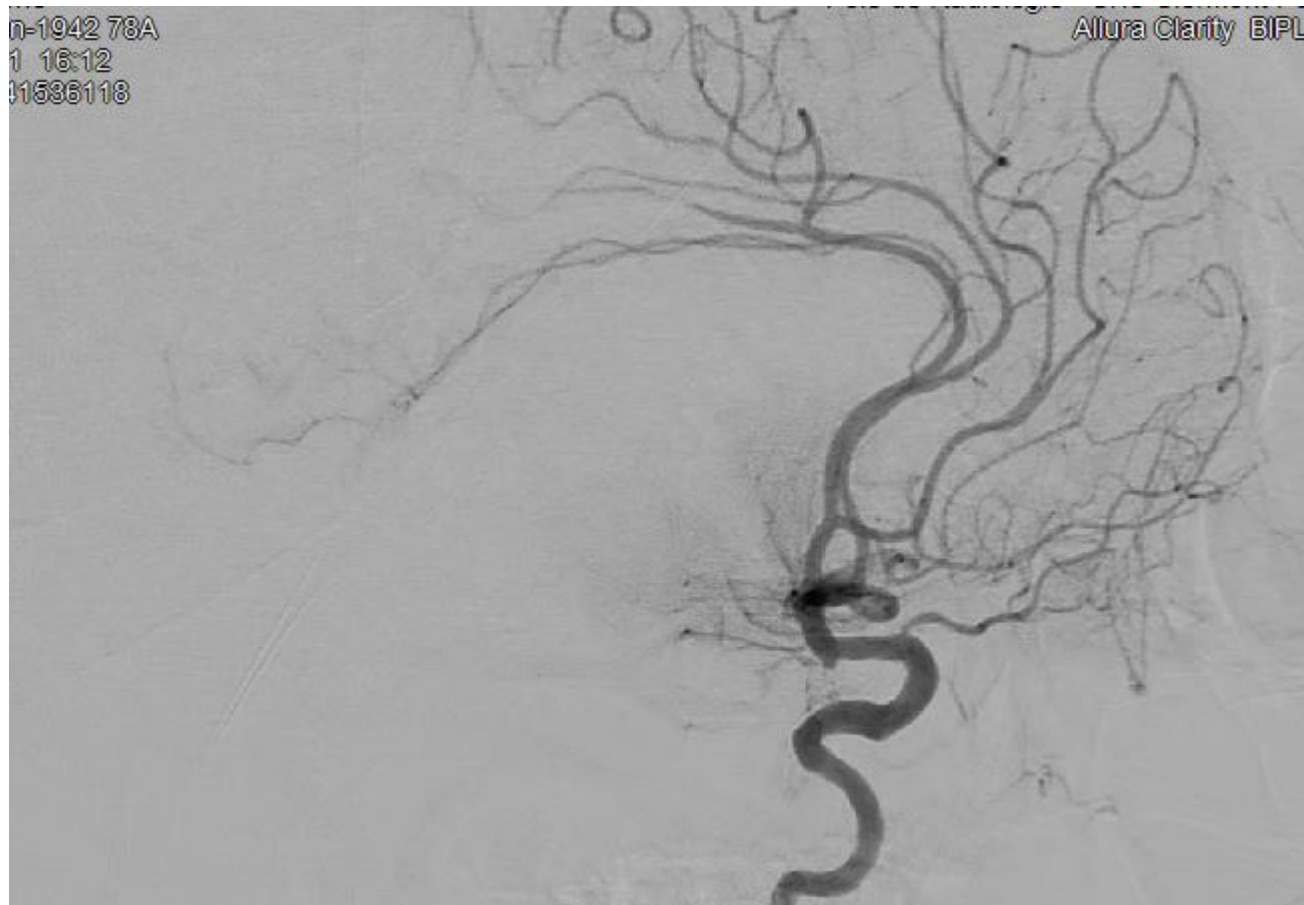
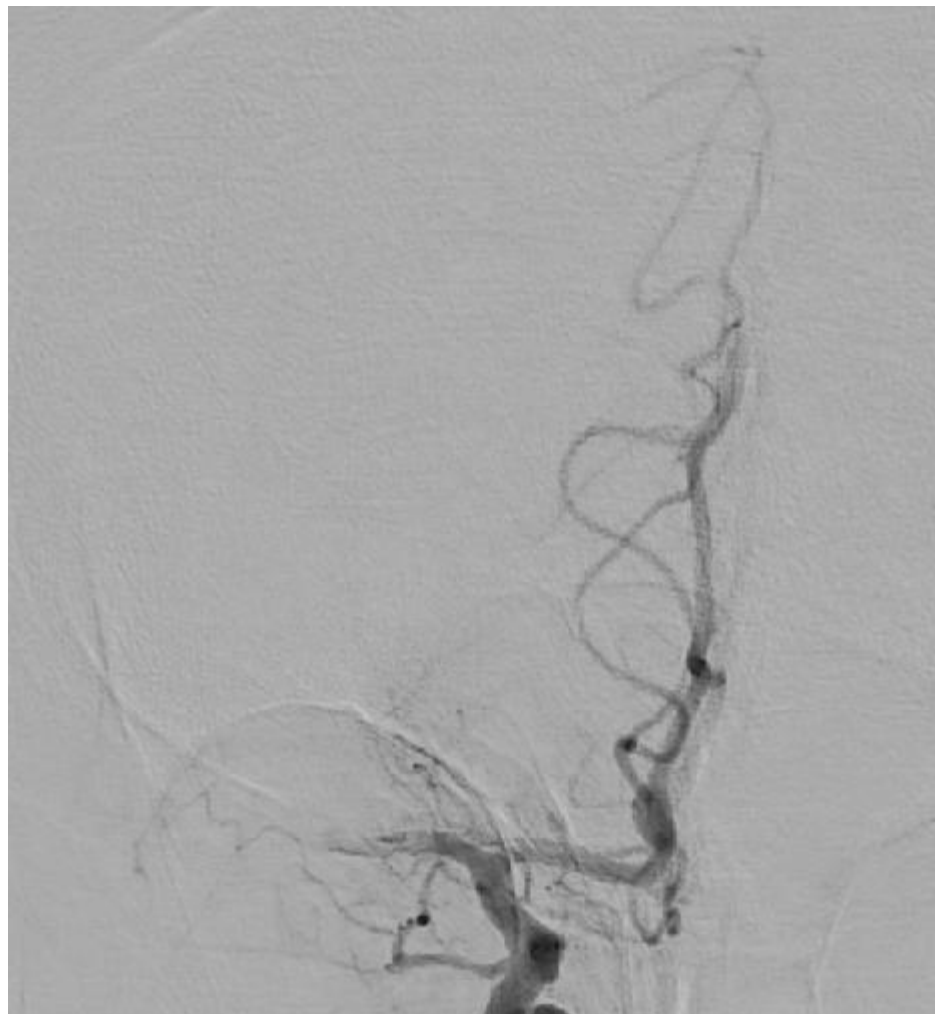
# mTICI

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 $\geq$ 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

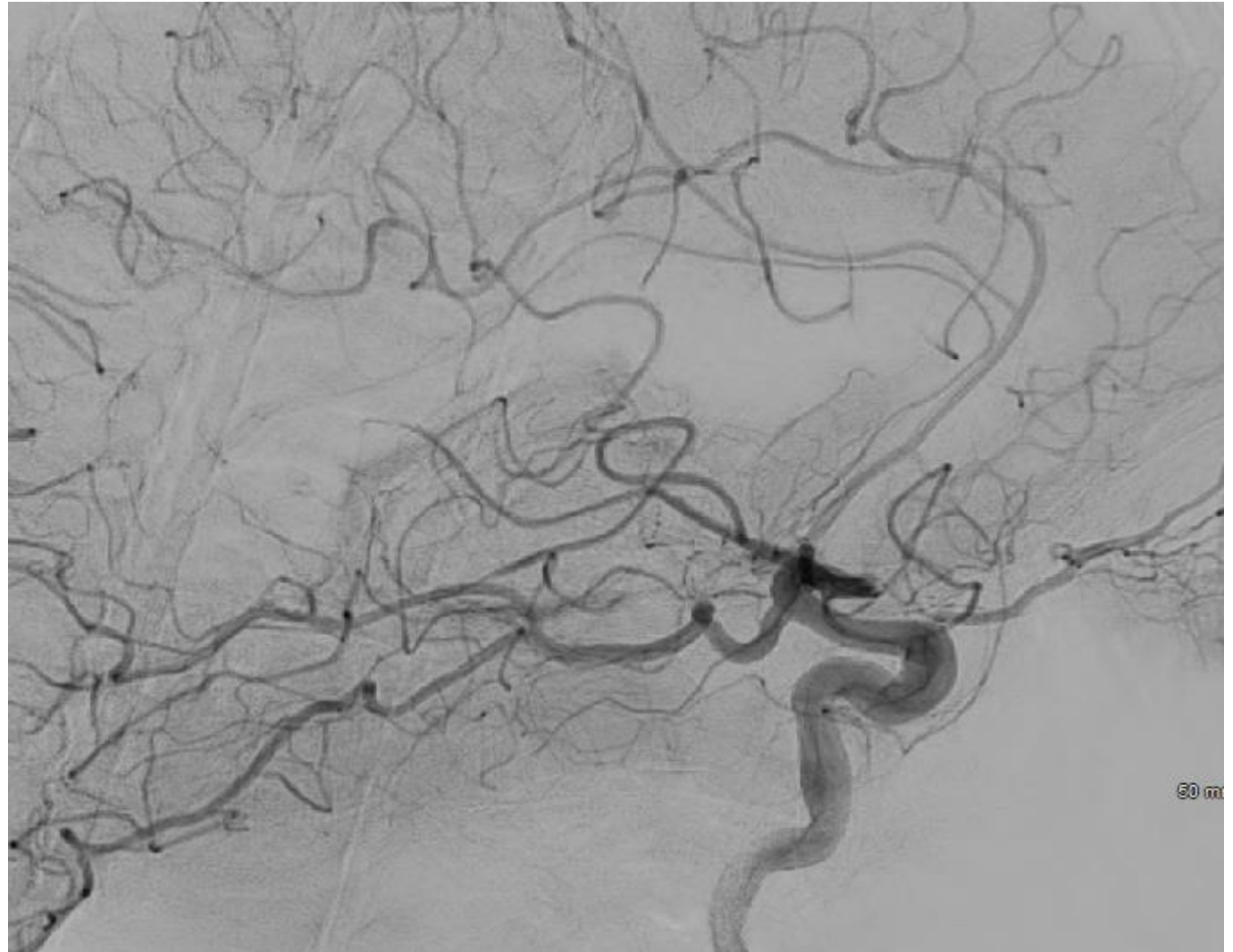
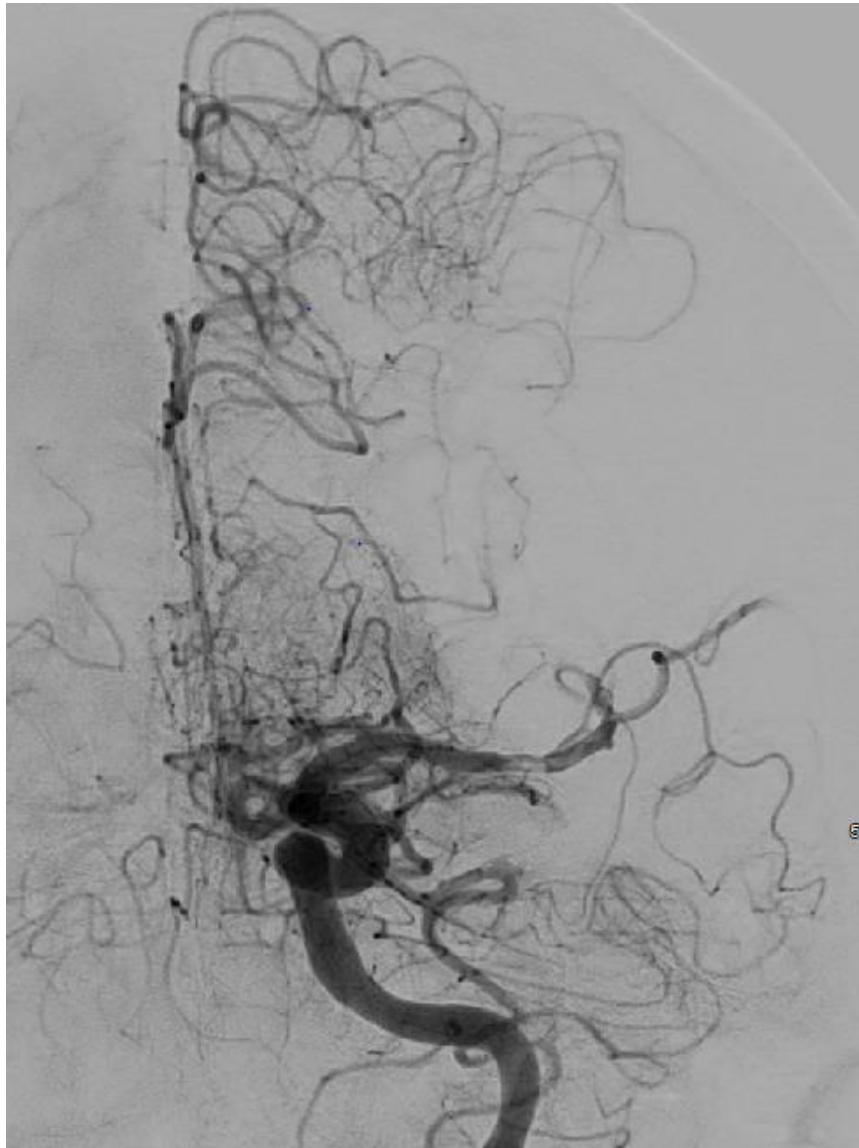
*J Neurointerv Surg.* 2014 March ; 6(2): 83–86. doi:10.1136/neurintsurg-2013-010665.

# mTICI 0

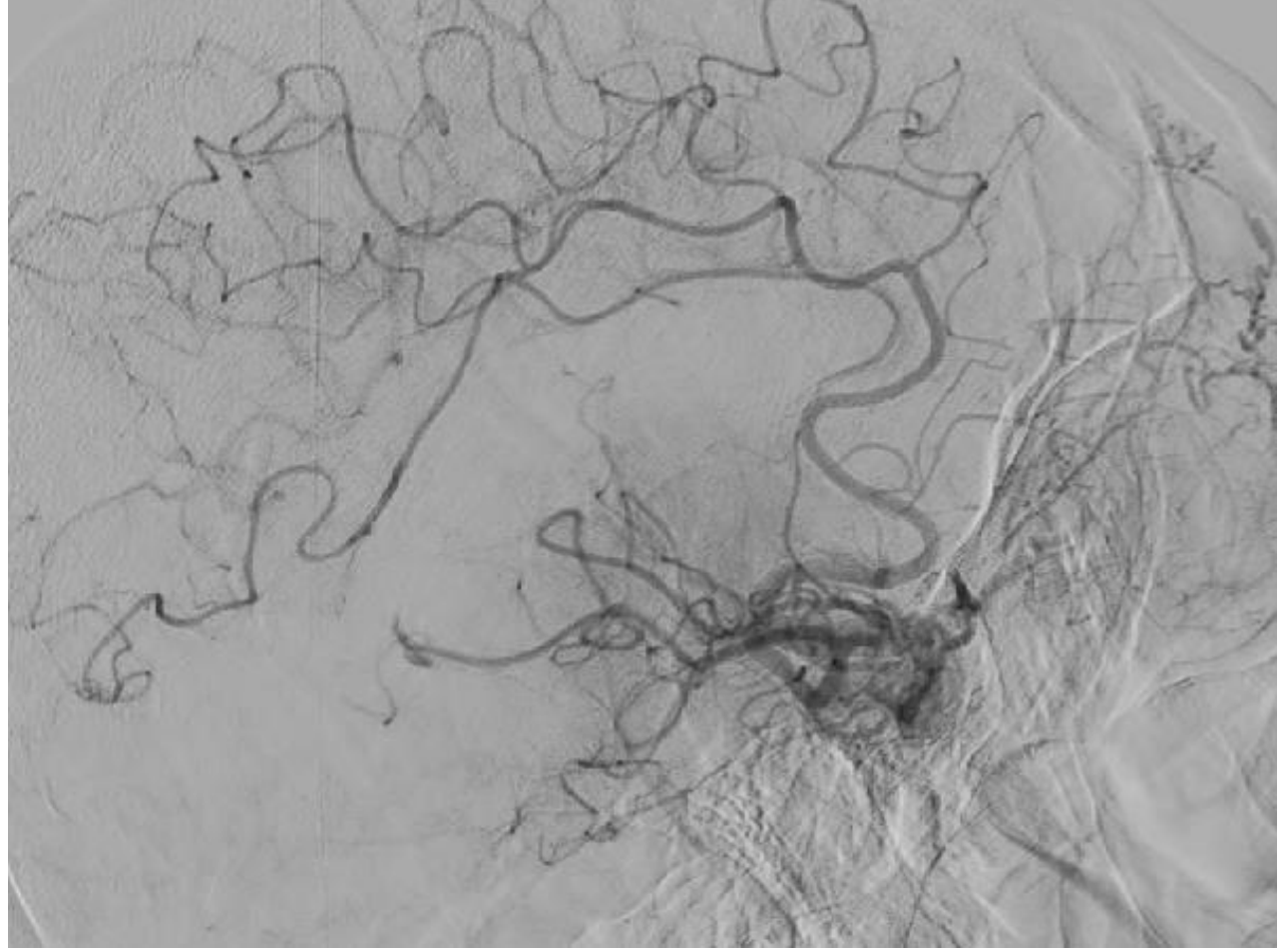
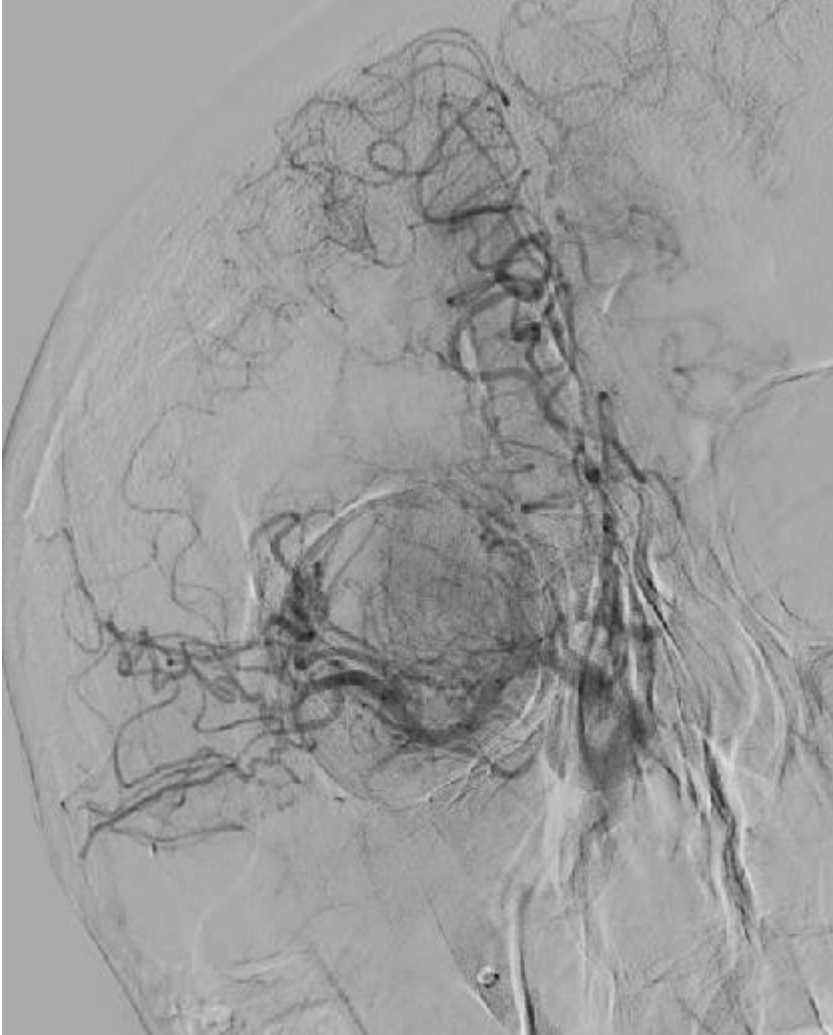




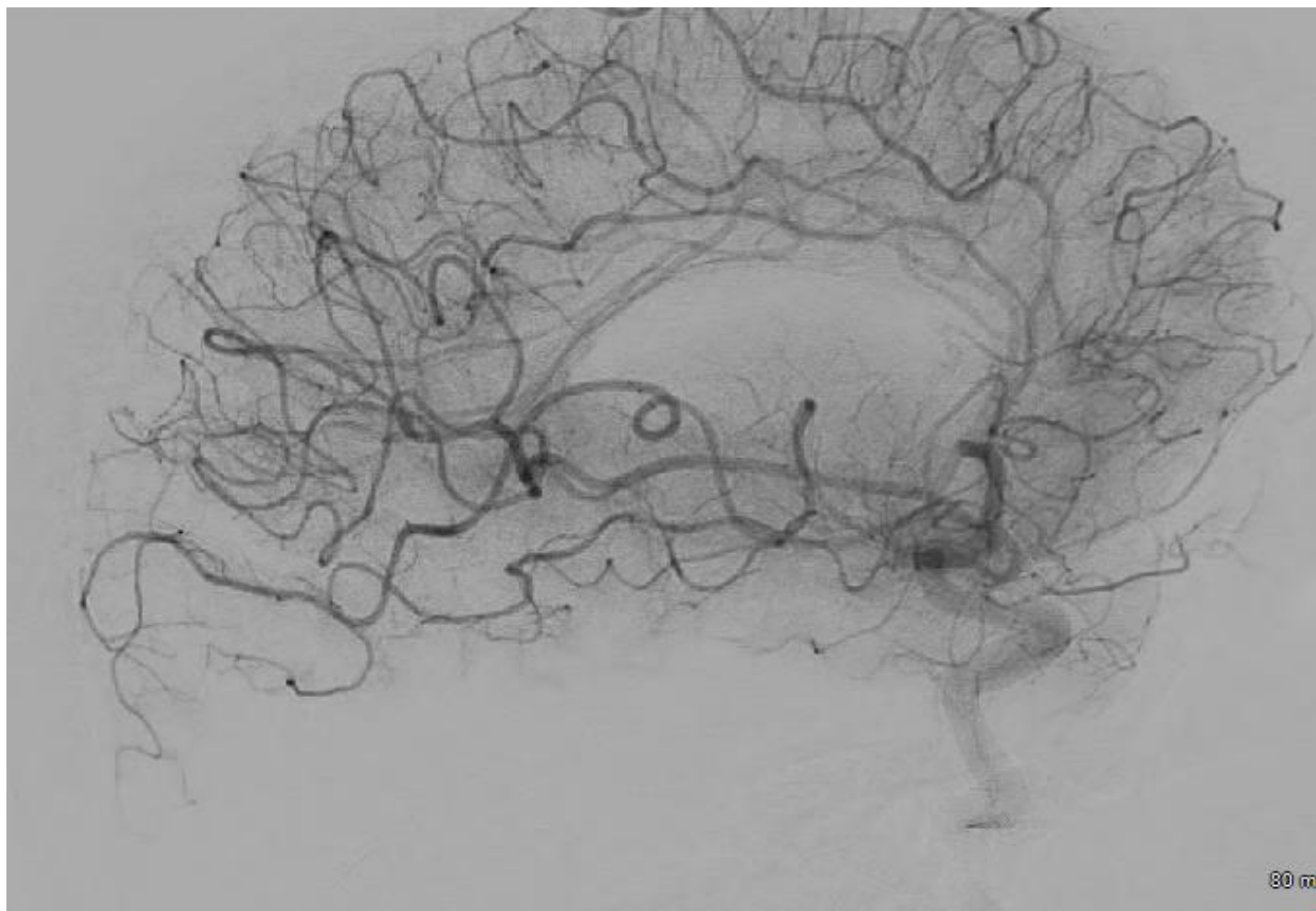
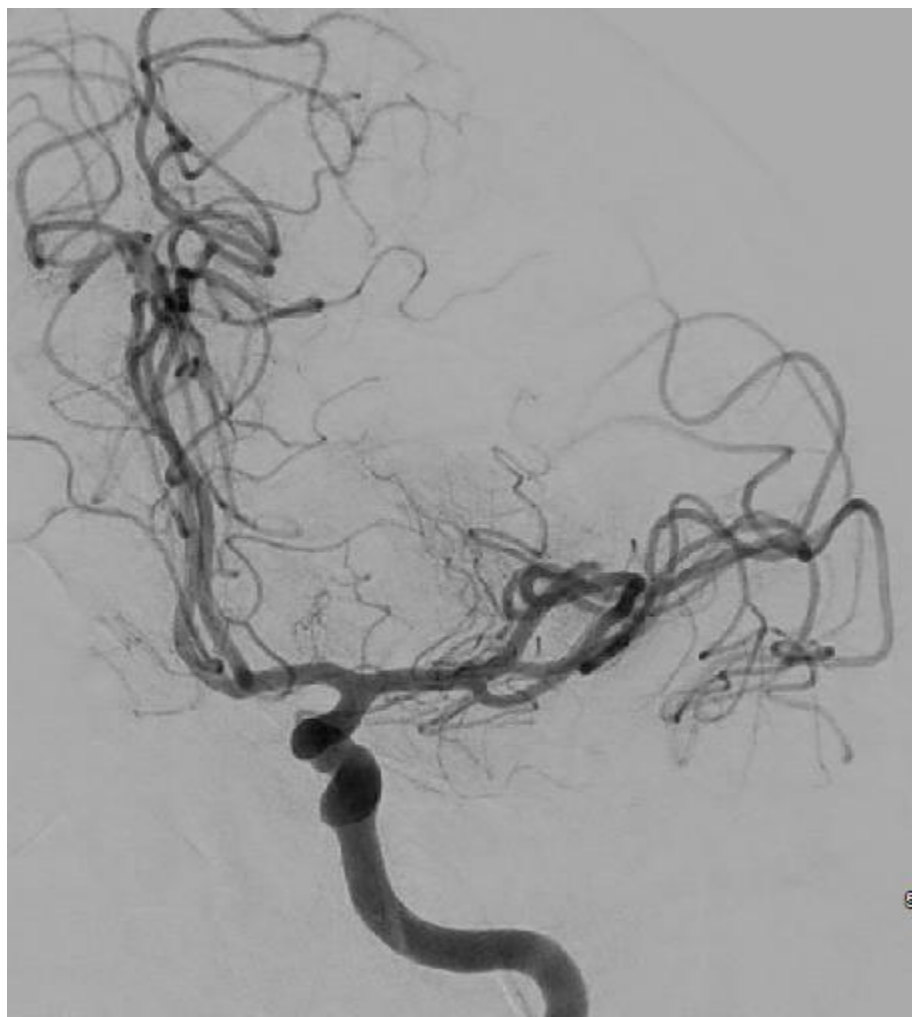
# mTICI 1



# mTICI 2a

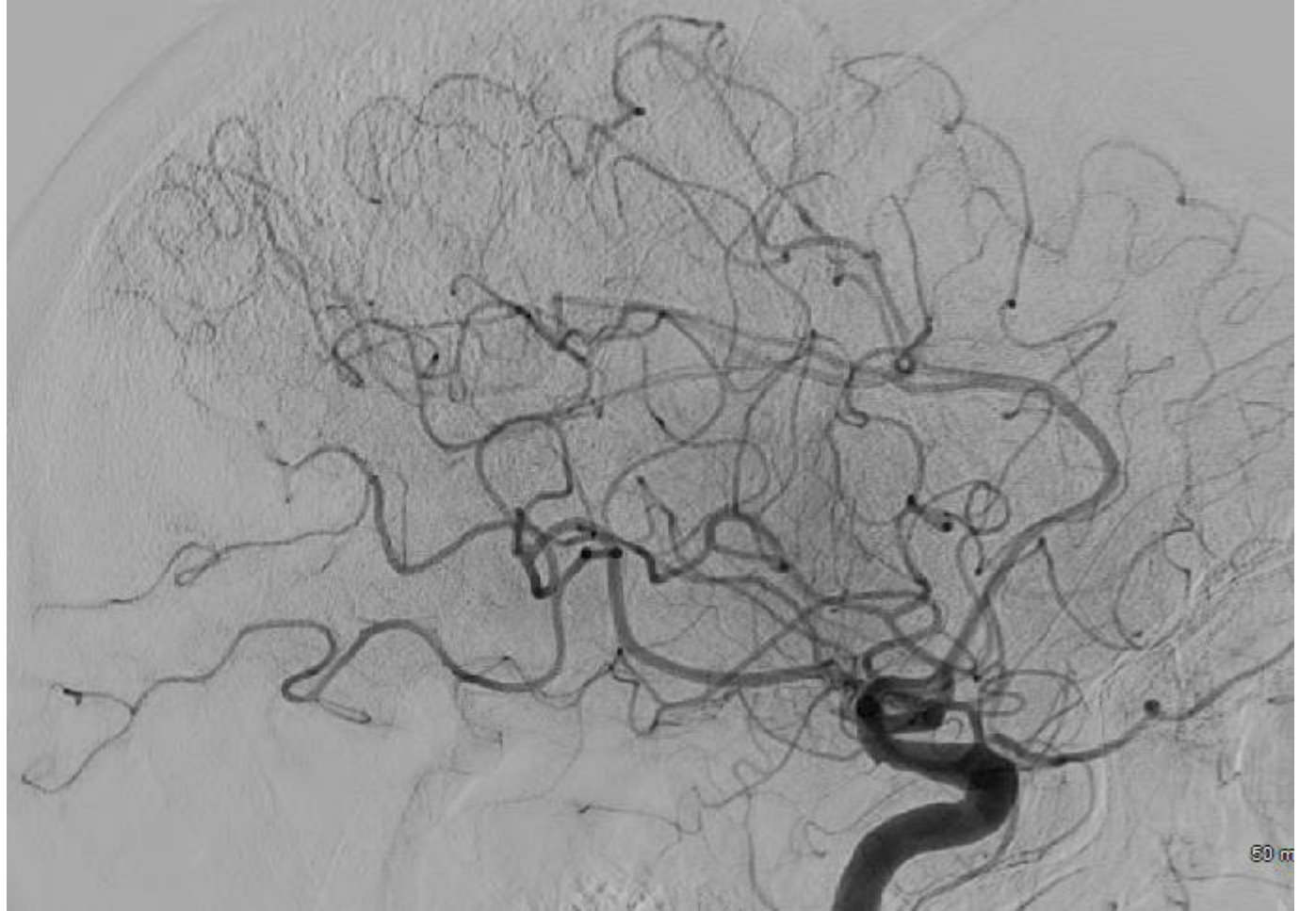


# mTICI 2b

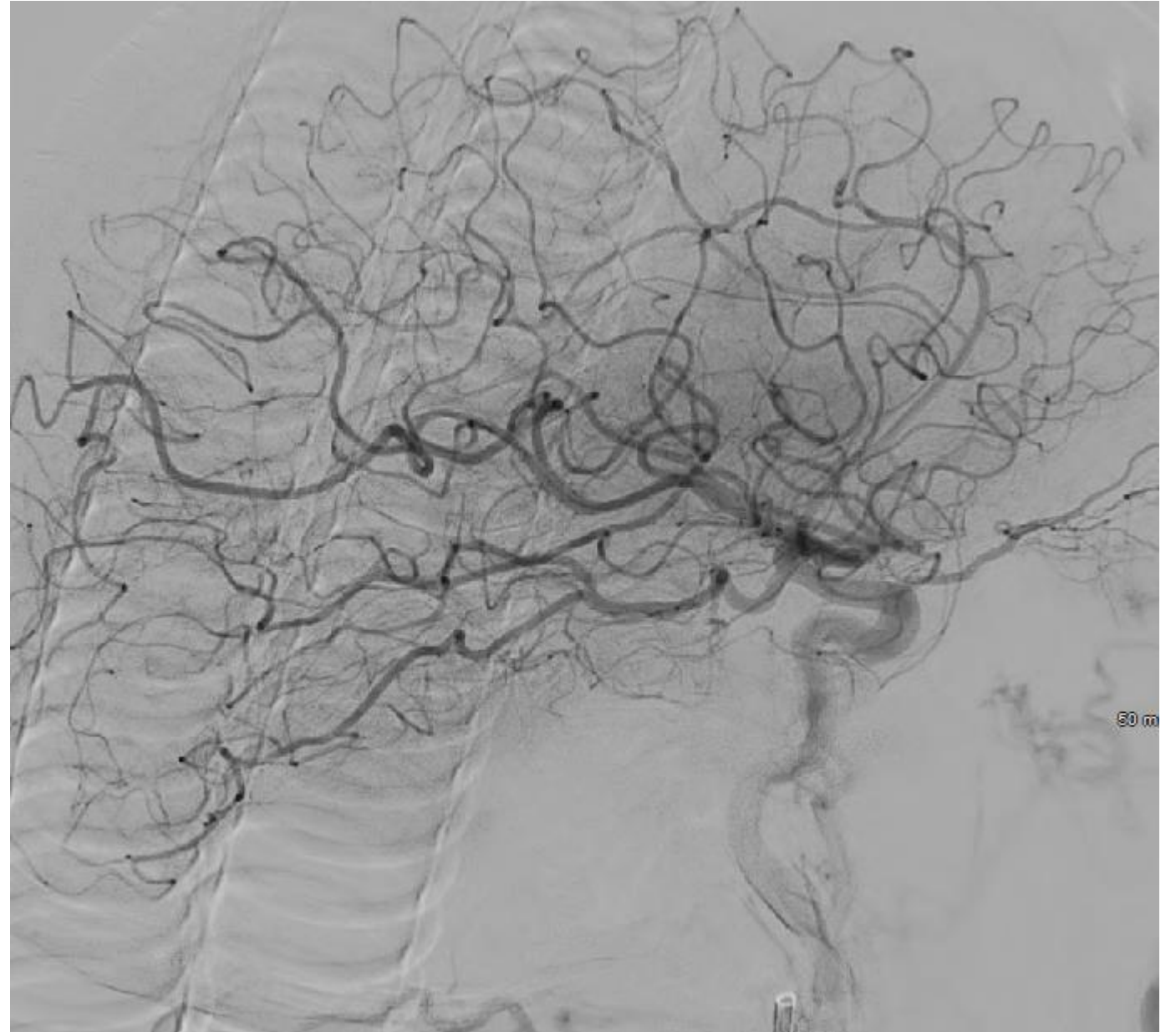
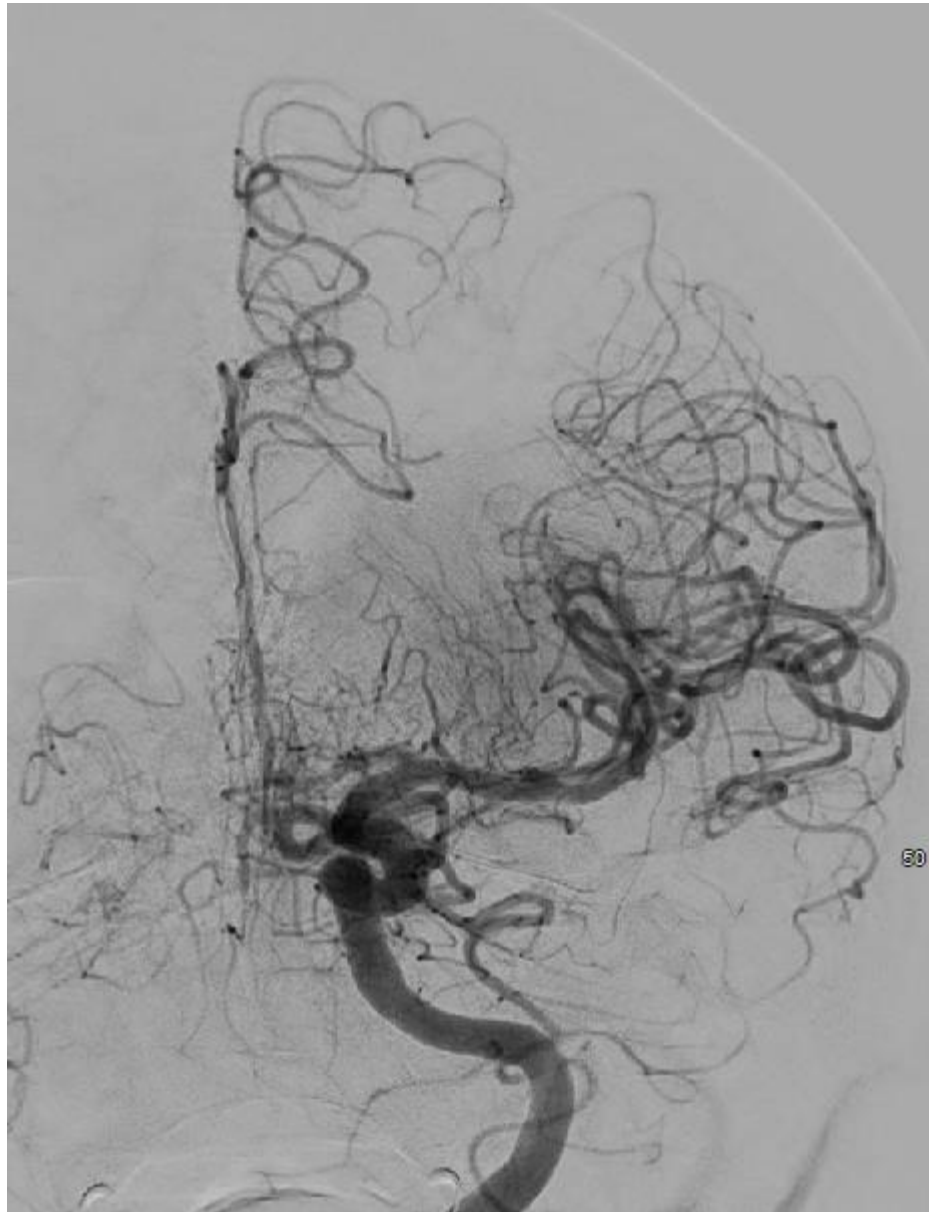




# mTICI 2c



# mTICI 3



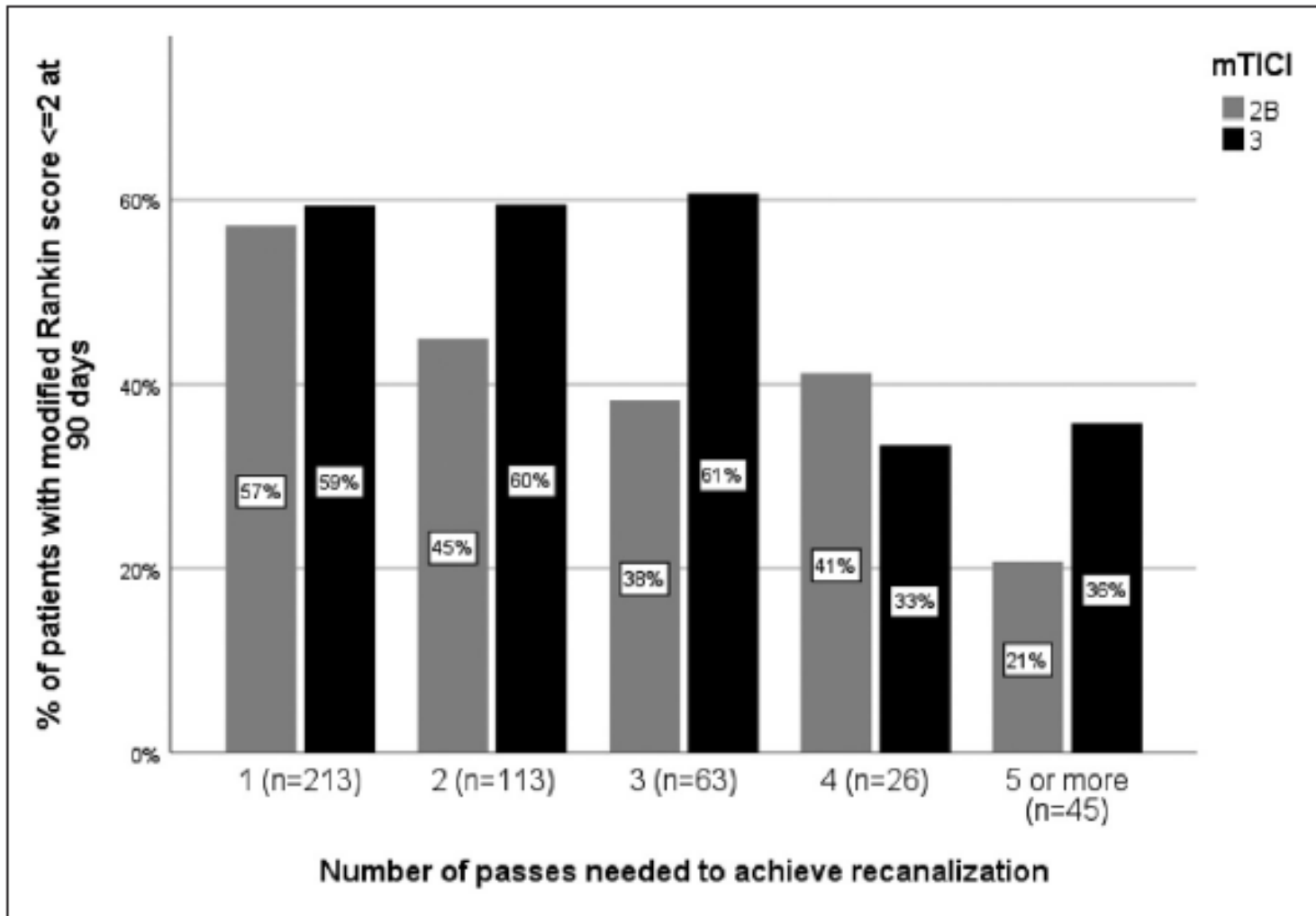
TICI 2b 2c ou 3

# 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)

Cyril Dargazanli, MD, MSc; Robert Fahed, MD; Raphael Blanc, MD, MSc;  
Benjamin Gory, MD, PhD; Julien Labreuche, BST; Alain Duhamel, PhD;  
Gaultier 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; Bertrand Lapergue, MD, PhD; for the ASTER Trial Investigators\*

	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
Adjusted OR (95% CI)§	1.00 (ref.)	2.13 (0.92–4.94)	1.98 (1.00–3.91)	0.097/0.062	2.02 (1.06–3.84); 0.031
Adjusted OR (95% CI)	1.00 (ref.)	1.89 (0.79–4.50)	1.88 (0.92–3.81)	0.18/0.094	1.88 (0.97–3.67); 0.063



**Figure 4.** Functional outcome depending on number of passes and degree of recanalization. mTICI indicates modified Thrombolysis in Cerebral Infarction.



**Nombre de passages**

# When to Stop

## Detrimental Effect of Device Passes in Acute Ischemic Stroke Secondary to Large Vessel Occlusion

Álvaro García-Tornel, MD; Manuel Requena, MD, Marta Rubiera, MD, PhD;  
Marian Muchada, MD, PhD; Jorge Pagola, MD, PhD; David Rodríguez-Luna, MD, PhD;  
Matias Deck, MD; Jesus Juega, MD; Noelia Rodríguez-Villatoro, MD; Sandra Boned, MD;  
Marta Olivé-Gadea, MD; Alejandro Tomasello, MD; David Hernández, MD;  
Carlos A. Molina, MD, PhD; Marc Ribo, MD, PhD

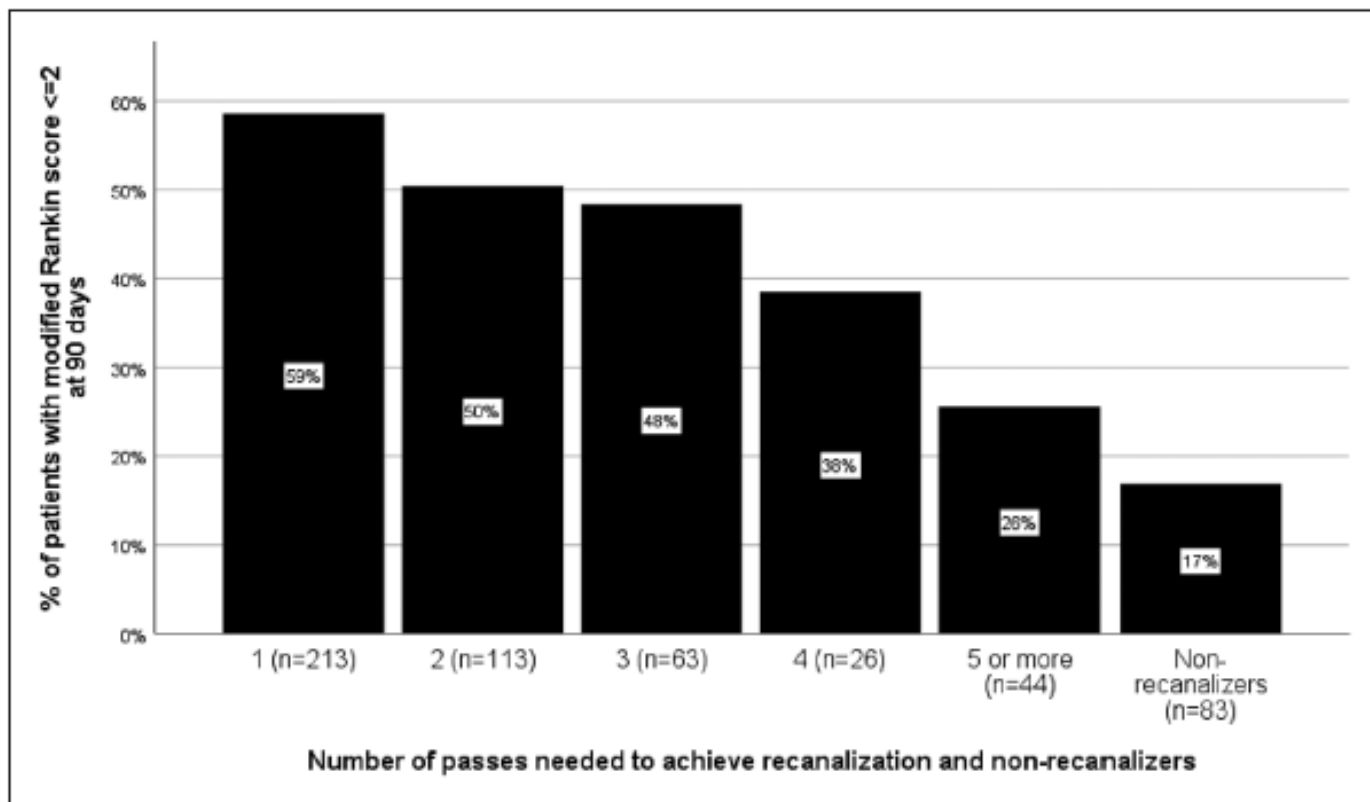
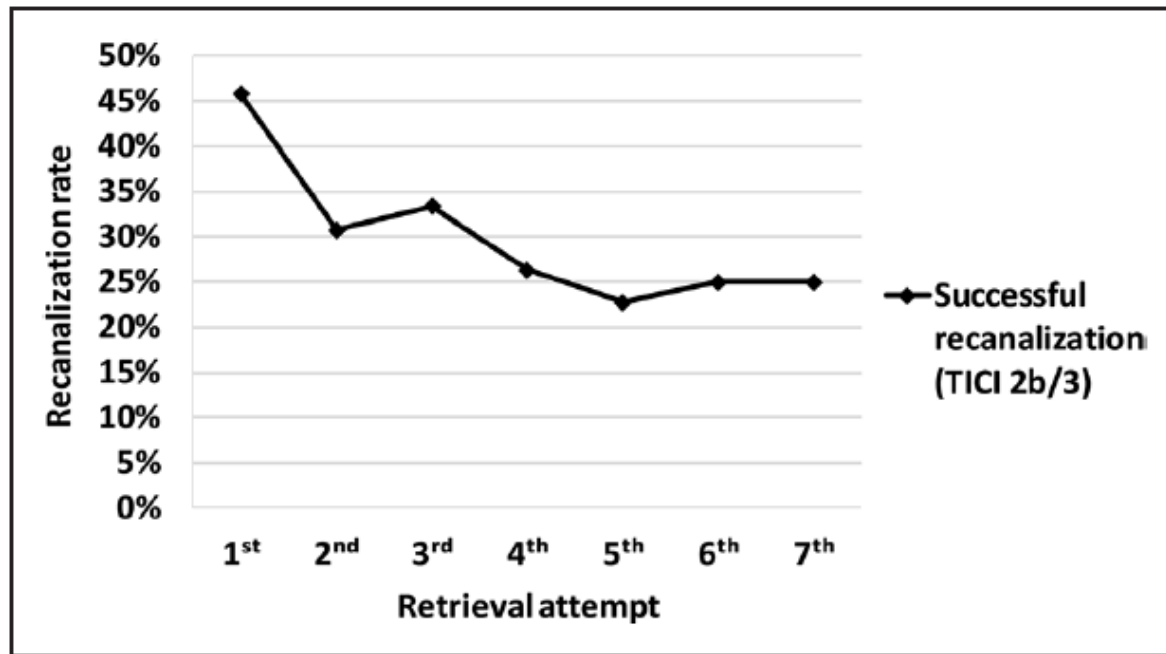


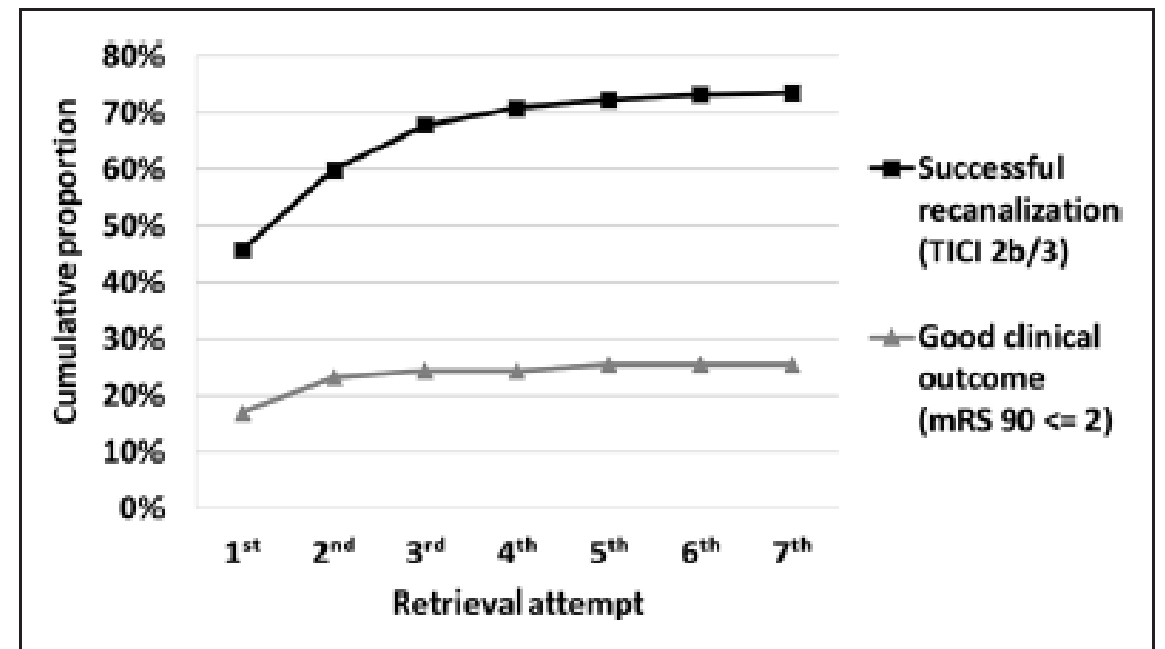
Figure 3. Functional outcome at 90 d depending on number of passes.

# Recanalization Rate per Retrieval Attempt in Mechanical Thrombectomy for Acute Ischemic Stroke

Fabian Flottmann, MD; Hannes Leischner, MD, PhD; Gabriel Brooks, MD; Jawed Nawabi, MD; Martina Bernhardt, MD; Tobias Djamsched Faizy, MD; Milani Deb-Chatterji, MD; Götz Thomalla, MD; Jens Fiehler, MD; Caspar Brekenfeld, MD



**Figure 1.** Recanalization rate per retrieval, defined as proportion of successful recanalizations in all patients who underwent a certain retrieval attempt. TICI indicates Thrombolysis in Cerebral Infarction.



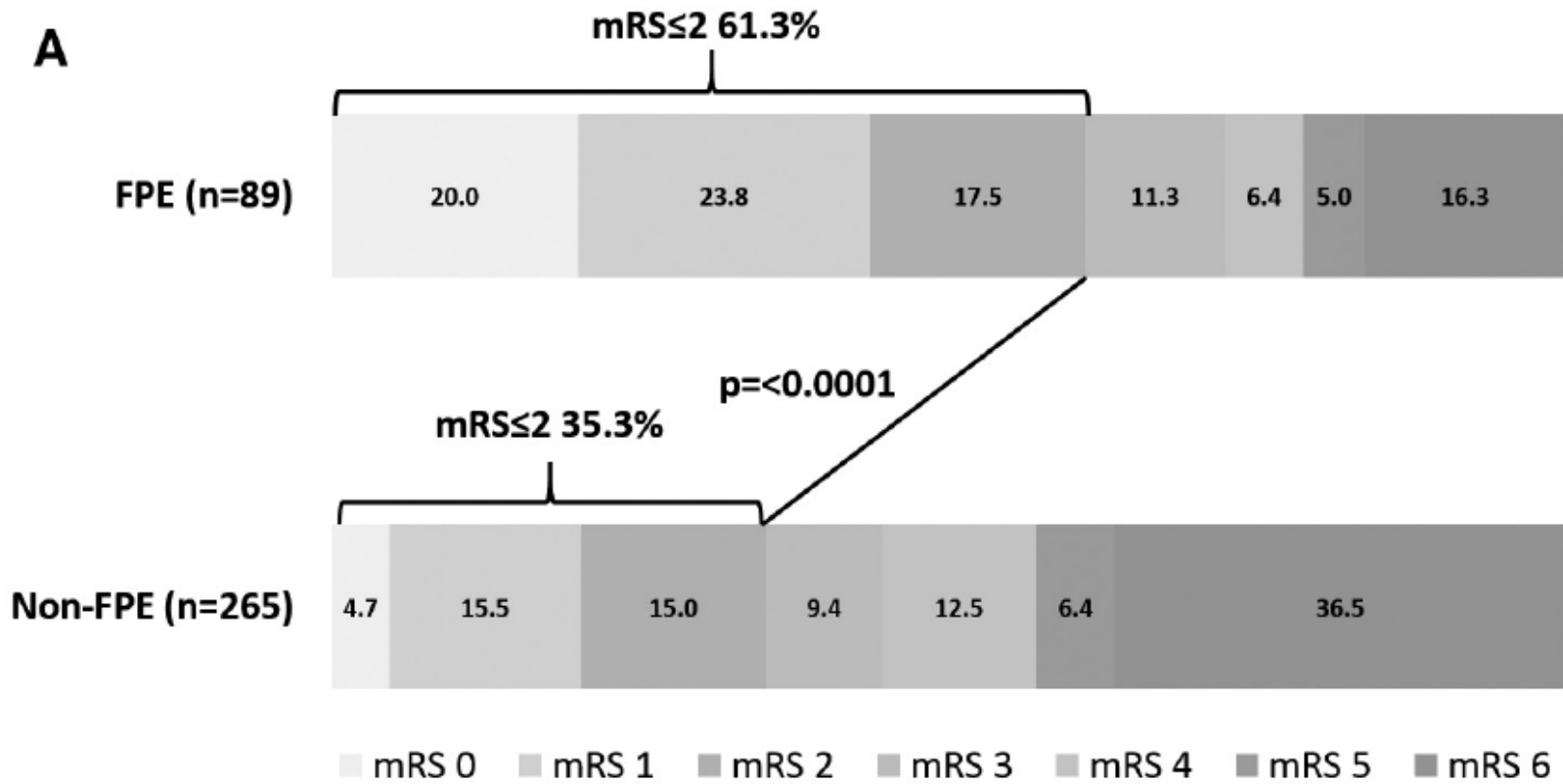
**Figure 2.** Cumulative proportion of patients with successful recanalization and of patients with good clinical outcome after each retrieval maneuver. mRS indicates modified Rankin Scale; and TICI, Thrombolysis in Cerebral Infarction.

# **First Pass Effect**

## **A New Measure for Stroke Thrombectomy Devices**

Osama O. Zaidat, MD; Alicia C. Castonguay, PhD; Italo Linfante, MD; Rishi Gupta, MD;  
Coleman O. Martin, MD; William E. Holloway, MD; Nils Mueller-Kronast, MD;  
Joey D. English, MD, PhD; Guilherme Dabus, MD; Tim W. Malisch, MD;  
Franklin A. Marden, MD; Hormozd Bozorgchami, MD; Andrew Xavier, MD; Ansaar T. Rai, MD;  
Michael T. Froehler, MD, PhD; Aamir Badruddin, MD; Thanh N. Nguyen, MD; M. Asif Taqi, MD;  
Michael G. Abraham, MD; Albert J. Yoo, MD, PhD; Vallabh Janardhan, MD; Hashem Shaltoni, MD;  
Roberta Novakovic, MD; Alex Abou-Chebl, MD; Peng R. Chen, MD; Gavin W. Britz, MD;  
Chung-Huan J. Sun, MD; Vibhav Bansal, MD; Ritesh Kaushal, MD; Ashish Nanda, MD;  
Raul G. Nogueira, MD

# First Pass effect



**Table 3. Comparison of the Clinical and Angiographic Outcomes in FPE vs Overall NASA, Any Final mTICI2b, and mFPE Cohorts**

	Full NASA (n=354)	FPE (n=89)	<i>P</i> Value; OR	Any mTICI 2b (n=114)	<i>P</i> Value (Any mTICI2b vs FPE)	mFPE (n=43)	<i>P</i> Value (FPE vs mFPE)
mRS score ≤2 (90 d)	132/315 (42%)	49/80 (61.3%)	0.002 (2.9;1.7–4.9)	47/106 (44.3%)	0.02	22 (52.4%)	0.35
NIHSS score (90 d), mean (SD)	22.6 (18.8)	13.2 (17.4)	0.003	21 (20)	0.11	22.6 (19)	0.01
slCH	35/352 (9.9%)	5/89 (5.6%)	0.20	14/113 (12%)	0.10	5/43 (11.6%)	0.22
Mortality	95/315 (30%)	13/80 (16.3%)	0.01	32/106 (30.2%)	0.03	13/42 (31%)	0.06
DE	56/341 (16.4%)	5/88 (5.7%)	0.01	33/112 (29.5%)	<0.0001	13/43 (30.2%)	0.01
ENT	19/344 (5.5%)	2/89 (2.3%)	0.20	3/110 (3%)	0.8	0/43 (0%)	0.20

FPE, first pass effect; mFPE, modified FPE; mTICI, Modified Thrombolysis in Cerebral Infarction; mRS, modified Rankin Scale; NASA, North American Solitaire Acute Stroke; NIHSS, National Institutes of Health Stroke Scale; and OR, odds ratio.

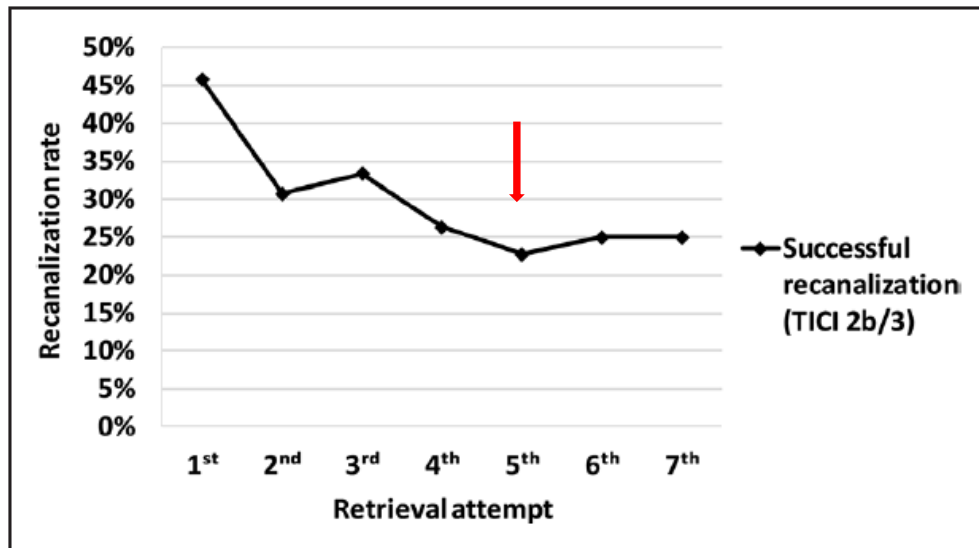
■ mRS 0 ■ mRS 1 ■ mRS 2 ■ mRS 3 ■ mRS 4 ■ mRS 5 ■ mRS 6

# Quand faut-il arrêter ?

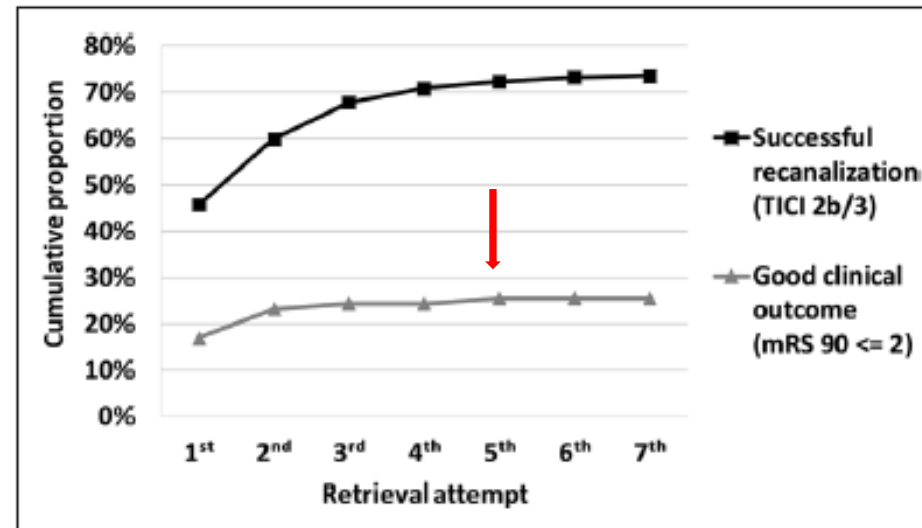
- Arrêter à cause de la survenue d'une complication
- Arrêter car échec de recanalisation malgré de nombreux passages
- Arrêter car recanalisation partielle

# Ca veut pas se déboucher

- Les questions à se poser devant un échec
  - S'arrêter après l'échec du 4<sup>ème</sup> passage: âge , mismatch initial, délai



**Figure 1.** Recanalization rate per retrieval, defined as proportion of successful recanalizations in all patients who underwent a certain retrieval attempt. TICI indicates Thrombolysis in Cerebral Infarction.



**Figure 2.** Cumulative proportion of patients with successful recanalization and of patients with good clinical outcome after each retrieval maneuver. mRS indicates modified Rankin Scale; and TICI, Thrombolysis in Cerebral Infarction.



# Ca veut pas se déboucher

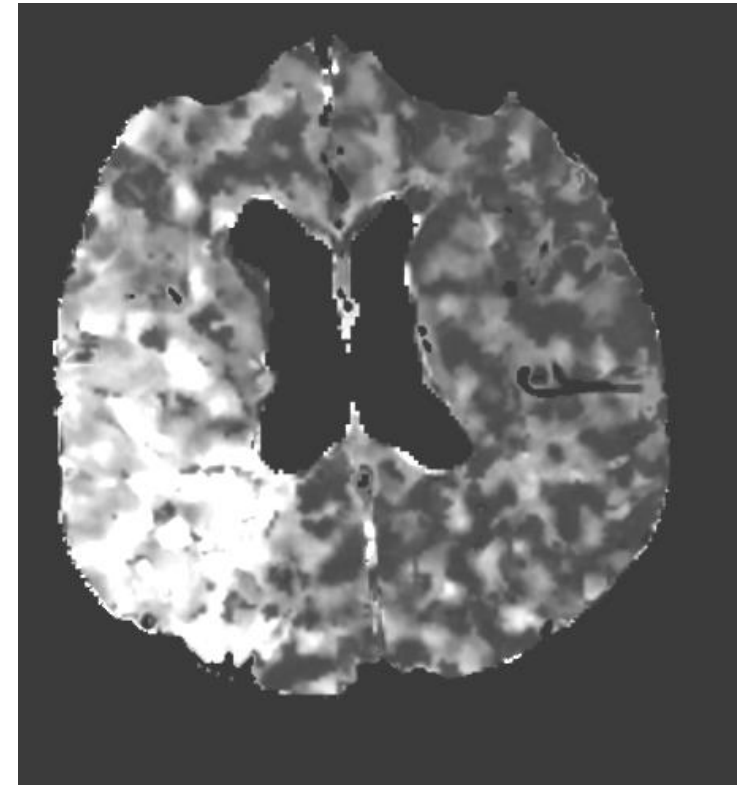
- Les questions à se poser devant un échec
  - S'arrêter après l'échec du 4 eme passage
  - **Changement de matériel**

# Ca veut pas se déboucher

- Les questions à se poser devant un échec
  - S'arrêter après l'échec du 4 eme passage
  - Changement de matériel
  - Sténose sous jacente:

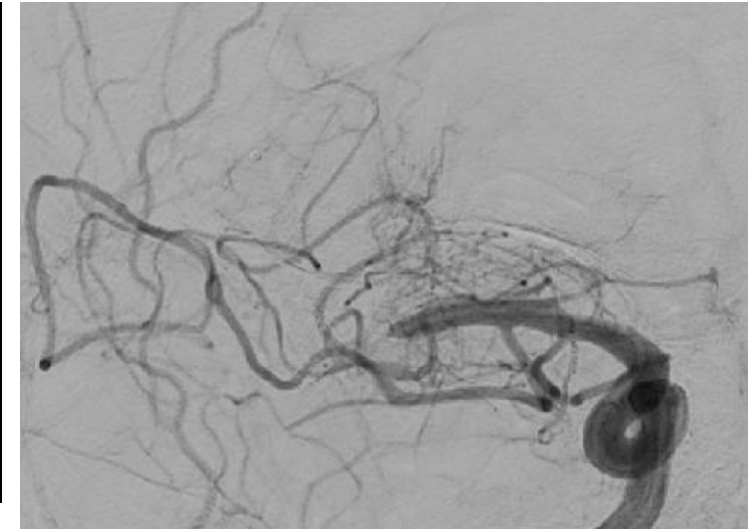
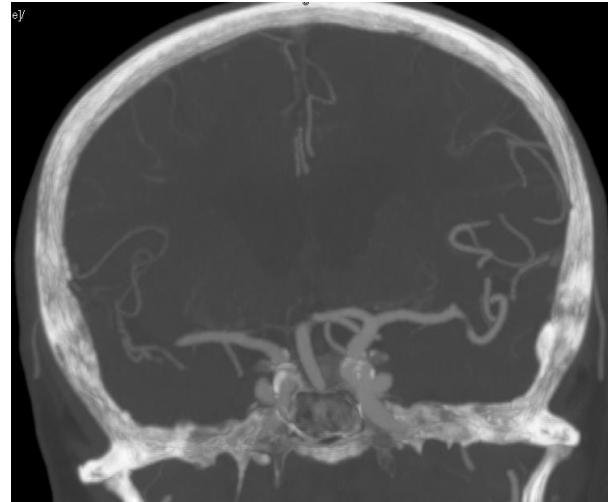
# Ca veut pas se déboucher

- Les questions à se poser devant un échec
  - S'arrêter après l'échec du 4<sup>ème</sup> passage
  - Changement de matériel
  - **Sténose sous jacente:**
    - Savoir la suspecter précocement
      - NIHSS faible malgré occlusion proximale
      - NIHSS fluctuant
      - Délai long
      - Collatéralité très développée



# Ca veut pas se déboucher

- Les questions à se poser devant un échec
  - S'arrêter après l'échec du 4<sup>ème</sup> passage
  - Changement de matériel
  - **Sténose sous jacente:**
    - Savoir la suspecter précocement
    - Privilégier l'aspiration seule
      - Mise à nu de la sténose



# Ca veut pas se déboucher

- Les questions à se poser devant un échec
  - S'arrêter après l'échec du 4 eme passage
  - Changement de matériel
  - **Sténose sous jacente:**
    - Savoir la suspecter précocement
    - Privilégier l'aspiration seule
    - Eviter de multiplier les passages de stent

# C'est pas mal mais ça pourrait être mieux

- Recanalisation partielle TICI 2a 2b
  - Au bout de combien de passages
  - Eloquence du territoire de ou des artères occluses
  - Viabilité du territoire de ou des artères occluses
  - TIV ou pas
  - TICI 3 à quel prix
    - Combien de passages
    - Thrombectomie distales

# 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)

Cyril Dargazanli, MD, MSc; Robert Fahed, MD; Raphael Blanc, MD, MSc;  
Benjamin Gory, MD, PhD; Julien Labreuche, BST; Alain Duhamel, PhD;  
Gaultier 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; Bertrand Lapergue, MD, PhD; for the ASTER Trial Investigators\*

	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
Adjusted OR (95% CI)§	1.00 (ref.)	2.13 (0.92–4.94)	1.98 (1.00–3.91)	0.097/0.062	2.02 (1.06–3.84); 0.031
Adjusted OR (95% CI)	1.00 (ref.)	1.89 (0.79–4.50)	1.88 (0.92–3.81)	0.18/0.094	1.88 (0.97–3.67); 0.063

# 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)

Cyril Dargazanli, MD, MSc; Robert Fahed, MD; Raphael Blanc, MD, MSc;  
Benjamin Gory, MD, PhD; Julien Labreuche, BST; Alain Duhamel, PhD;  
Gaultier 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; Bertrand Lapergue, MD, PhD; for the ASTER Trial Investigators\*

	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
Adjusted OR (95% CI)§	1.00 (ref.)	2.13 (0.92–4.94)	1.98 (1.00–3.91)	0.097/0.062	2.02 (1.06–3.84); 0.031
Adjusted OR (95% CI)	1.00 (ref.)	1.89 (0.79–4.50)	1.88 (0.92–3.81)	0.18/0.094	1.88 (0.97–3.67); 0.063

§Adjusted for prespecified baseline factors (center, first-line CA strategy, age, hypertension, diabetes mellitus, baseline NIHSS score, and site of occlusion).

||Adjusted for prespecified baseline factors and complications (procedure-related adverse events and parenchymal hematoma).



# Impact of Repeated Clot Retrieval Attempts on Infarct Growth and Outcome After Ischemic Stroke

Wagih Ben Hassen, Caroline Touloupas, Joseph Benzakoun, Gregoire Boulouis, Martin Bretzner, Nicolas Bricout, Laurence Legrand, Christine Rodriguez, Alice Le Berre, Pierre Seners, Guillaume Turc, Charlotte Cordonnier, Catherine Oppenheim, Hilde Henon, Olivier Naggara

First published June 23, 2021, DOI: <https://doi.org/10.1212/WNL.00000000000012321>

- Le nombre de tentatives de recanalisation était associé à:
  - Plus d'embols dans de nouveaux territoires ( $p = 0.73$ ,  $p = 10^{-4}$ )
  - Une croissance plus importante du volume de nécrose [CI] 95%: 0.97–9.74,  $p = 0.03$

# Subarachnoid Hemorrhage in Mechanical Thrombectomy for Acute Ischemic Stroke: Analysis of the STRATIS Registry, Systematic Review, and Meta-Analysis

Hubert Lee<sup>1,2</sup>, Ayman M. Qureshi<sup>1,3</sup>, Nils H. Mueller-Kronast<sup>4</sup>, Osama O. Zaidat<sup>5</sup>, Michael T. Froehler<sup>6</sup>, David S. Liebeskind<sup>7</sup> and Vitor M. Pereira<sup>1,8\*</sup>

**TABLE 2** | Predictors of post-thrombectomy SAH—multivariate logistic regression for anterior circulation vessel occlusions.

	Univariate			Multivariate		
	OR	95% CI	P-value	OR	95% CI	P-value
Diabetes mellitus	1.85	(0.99, 3.47)	0.054	–	–	–
Location of vessel occlusion: proximal vs. distal*	2.81	(1.48, 5.34)	0.002	3.18	(1.63, 6.18)	<0.001
IV t-PA Use	0.46	(0.25, 0.85)	0.013	0.46	(0.25, 0.85)	0.014
Number of passes	1.27	(1.04, 1.55)	0.017	1.34	(1.09, 1.64)	0.005
Procedure Time (10 min)	1.08	(1.02, 1.16)	0.016	–	–	–

Variables no longer significant following multivariate logistic regression are denoted by "–". IV-tPA, intravenous tissue plasminogen activator; OR, odds ratio; CI, confidence interval.

\*Only anterior circulation vessel occlusions were included comparing internal carotid artery terminus and middle cerebral artery (MCA) M1 (proximal) to MCA M2 and M3 (distal).

# Subarachnoid Hemorrhage in Mechanical Thrombectomy for Acute Ischemic Stroke: Analysis of the STRATIS Registry, Systematic Review, and Meta-Analysis

Hubert Lee<sup>1,2</sup>, Ayman M. Qureshi<sup>1,3</sup>, Nils H. Mueller-Kronast<sup>4</sup>, Osama O. Zaidat<sup>5</sup>, Michael T. Froehler<sup>6</sup>, David S. Liebeskind<sup>7</sup> and Vitor M. Pereira<sup>1,8\*</sup>

**TABLE 2** | Predictors of post-thrombectomy SAH—multivariate logistic regression for anterior circulation vessel occlusions.

	Univariate			Multivariate		
	OR	95% CI	P-value	OR	95% CI	P-value
Diabetes mellitus	1.85	(0.99, 3.47)	0.054	–	–	–
Location of vessel occlusion: proximal vs. distal*	2.81	(1.48, 5.34)	0.002	3.18	(1.63, 6.18)	<0.001
IV t-PA Use	0.46	(0.25, 0.85)	0.013	0.46	(0.25, 0.85)	0.014
Number of passes	1.27	(1.04, 1.55)	0.017	1.34	(1.09, 1.64)	0.005
Procedure Time (10 min)	1.08	(1.02, 1.16)	0.016	–	–	–

Variables no longer significant following multivariate logistic regression are denoted by “–”. IV-tPA, intravenous tissue plasminogen activator; OR, odds ratio; CI, confidence interval.

\*Only anterior circulation vessel occlusions were included comparing internal carotid artery terminus and middle cerebral artery (MCA) M1 (proximal) to MCA M2 and M3 (distal).

# Synthèse

# Echec de recanalisation

## Continuer après 4 passages

- Recanalisation => amélioration clinique
- Plusieurs techniques disponibles à essayer
- Vous ramenez du thrombus à chaque passage
- Sténose sous jacente ?
- Intérêt de déployer un stent en dernier recours ?

## Arrêter les frais

- Taux d'évolution clinique favorable chute avec le nombre de tentatives
- Probabilité de recanalisation chute avec le nombre de tentative
- Le taux de complications augmente avec le nombre de tentative

# Recanalisation partielle

## TICI 2c-3

- TICI 2c-3 > TICI 2b pour l'évolution clinique favorable
- Territoire éloquent et viable
- Thrombectomies mécaniques distales possibles (M2 distale, M3)

## Le mieux est l'ennemi du bien

- Le taux de complications augmente avec le nombre de tentatives
- Le taux de complications augmente pour les thrombectomies distales
- Thrombolyse efficace sur les petits thrombus

**Merci**