Ecole de la Thrombectomie

# Occlusion en tandem

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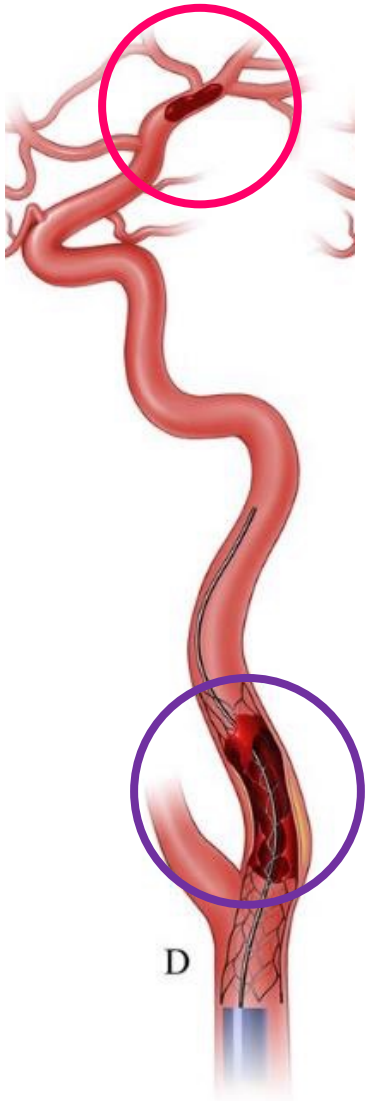
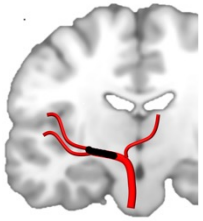
JENI Research Collaborative Group

APHM Assistance Publique Hôpitaux de Marseille

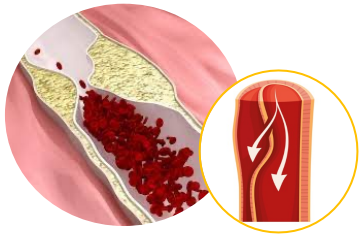
Centre Hospitalier de Bastia

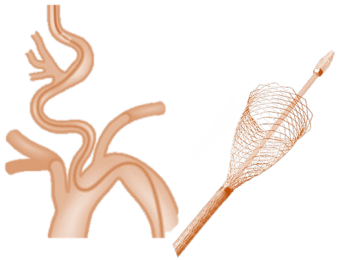
# En Introduction…



15%





- Occlusion proximale de la circulation cérébrale antérieure **intra crânienne**
- associée à une pathologie **carotidienne extra crânienne** occlusive ou sténosante d'amont
- 10 à 15% des AIS-LVO
- Étiologie : athérome (75%) >>> dissection (25%
- Pathologie grave
- Procédures de Thrombectomies plus longues, plus difficiles

# Objectifs & questions


1. Comment faire le diagnostic ?
2. Bénéfice de la thrombectomie ?
3. Quelle stratégie thérapeutique ?

# Objectifs & questions


1. **Comment faire le diagnostic ?**
2. Bénéfice de la thrombectomie ?
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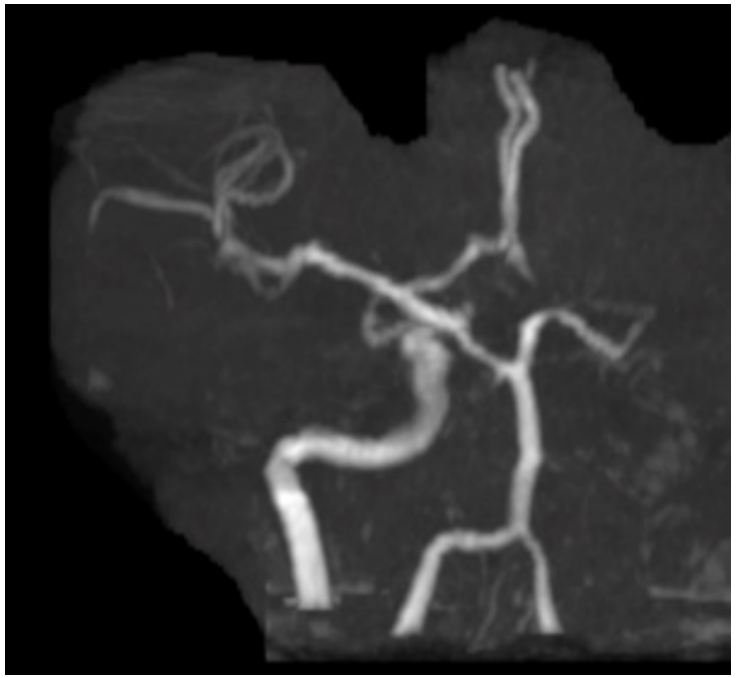
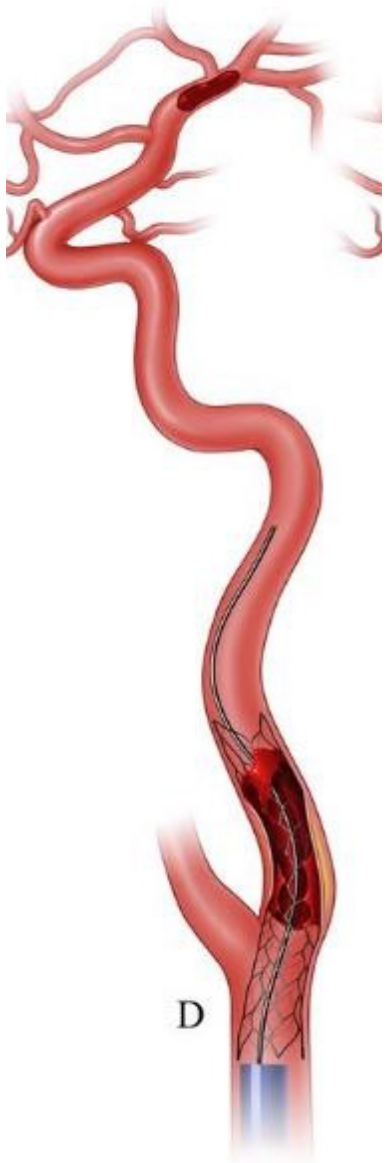
# Comment faire le diagnostic

- Diagnostic positif d'occlusion en tandem non trivial
- Scanner et IRM peuvent confondre occlusion et pseudo-occlusion (C1, L, T, M1prox)

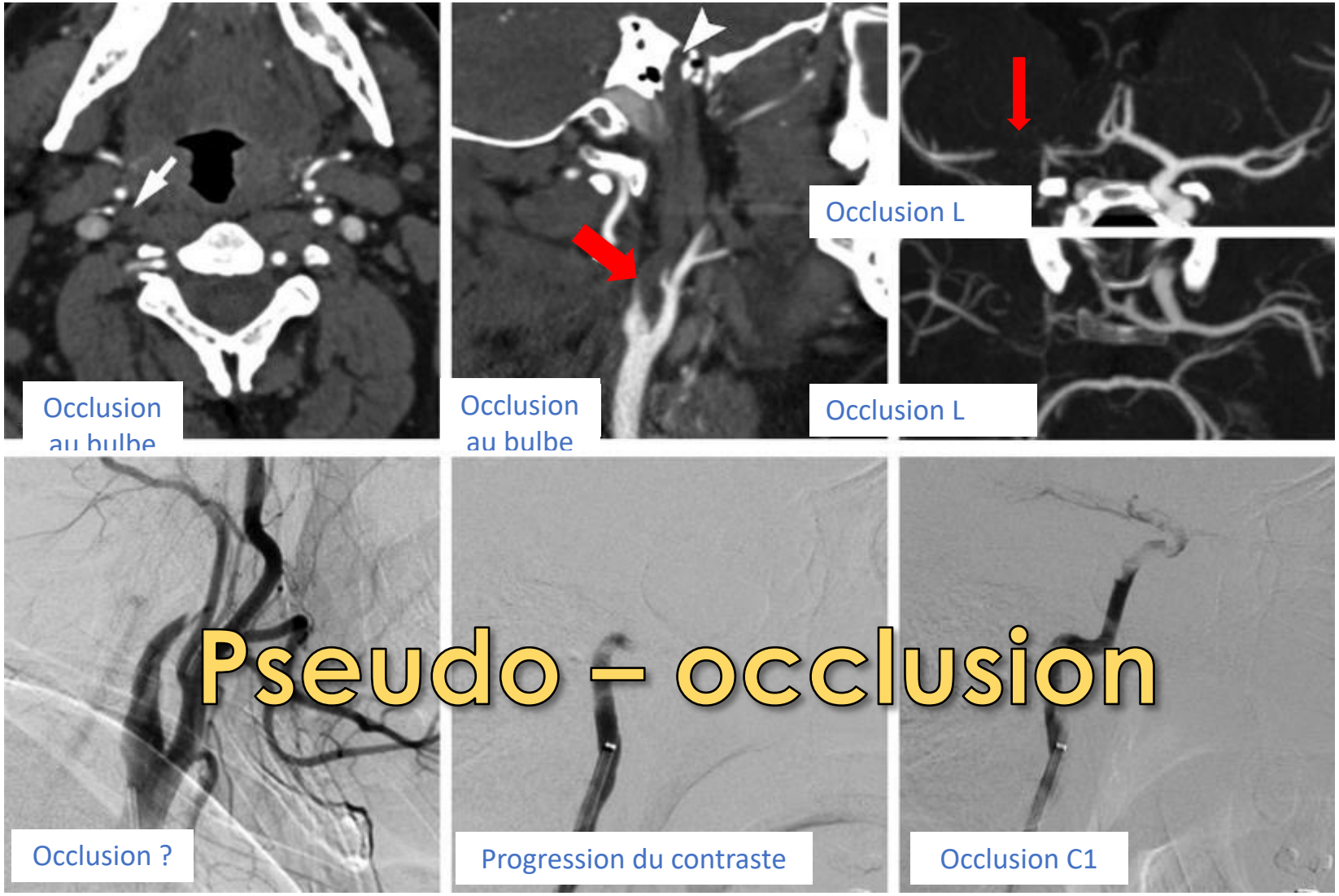





*W Boisseau et al. AJNR 2021*

# Comment faire le diagnostic

## Occlusion ou pseudo-occlusion en scanner

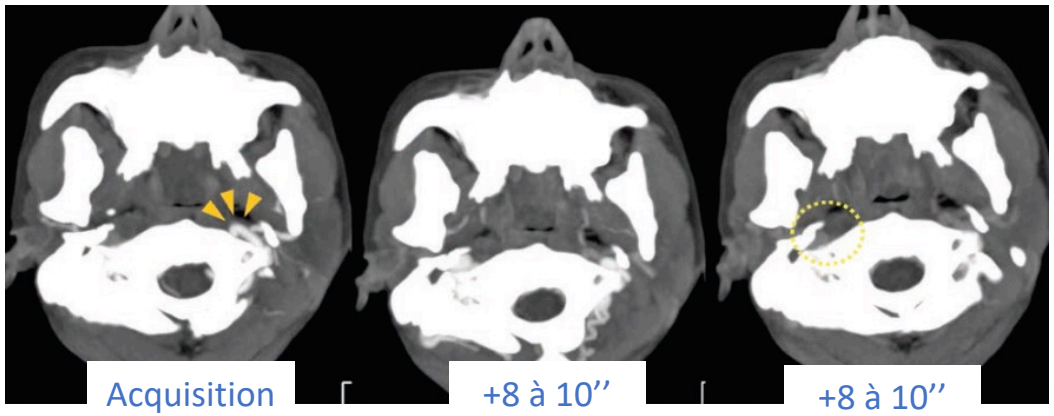


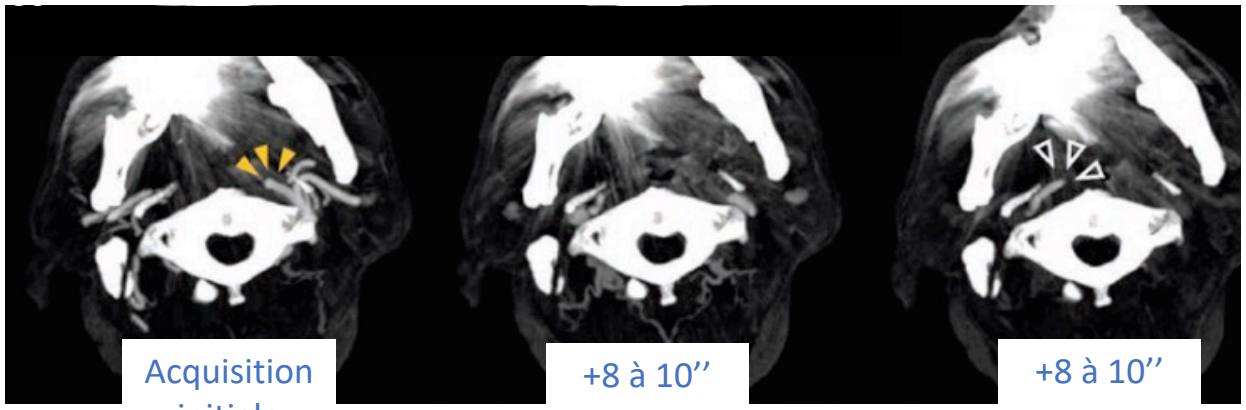

*A Diouf et al. Radiology 2018*
*32%*

# Comment faire le diagnostic

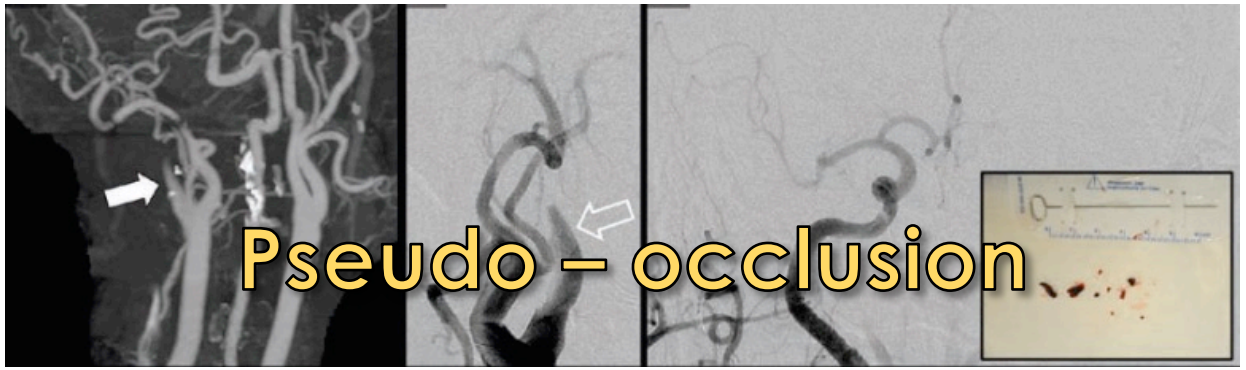
## Occlusion ou pseudo-occlusion en scanner

Intérêt du scanner multiphase / Sensibilité 70% → 95%





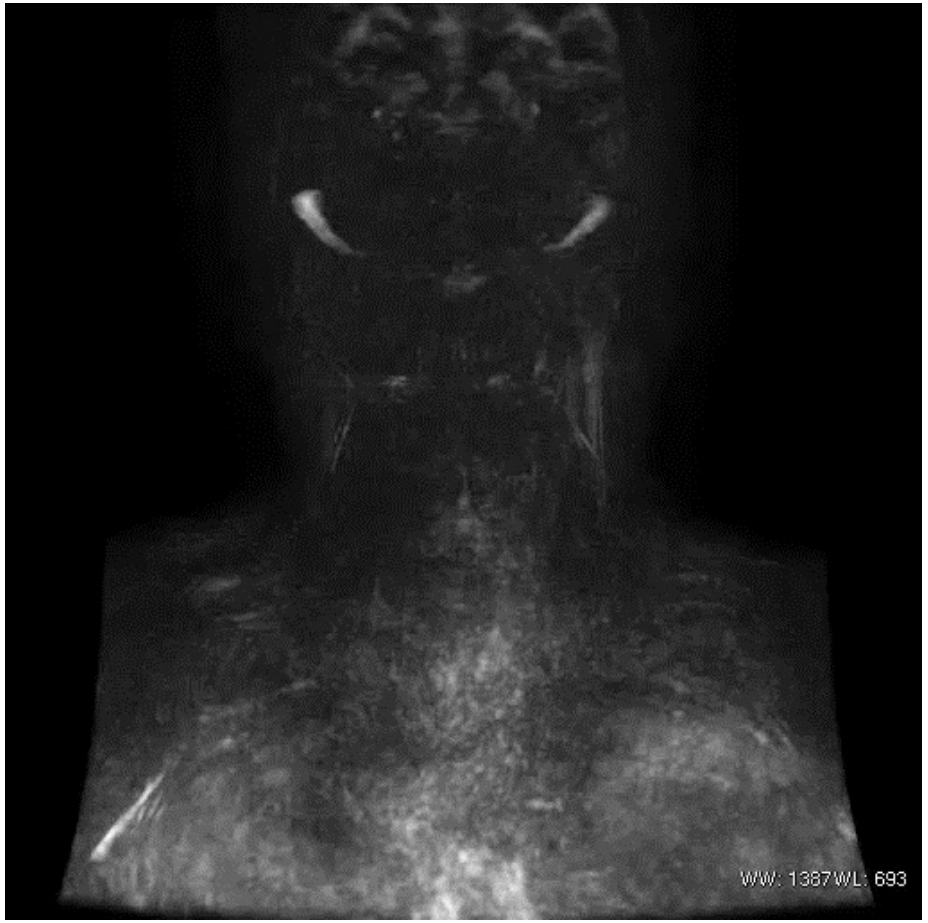



*Jai Ho Choi et al. Stroke 2018*
*Menon BK et al Radiology 2015*

# Comment faire le diagnostic

## Affirmer la « double » occlusion en IRM

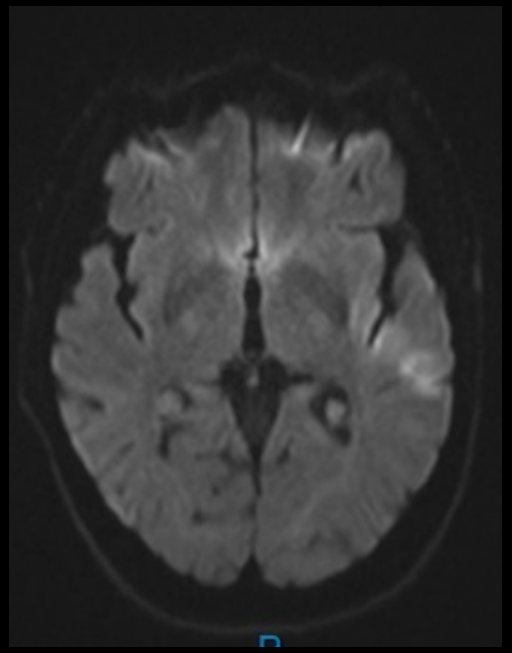
- TOF : non distinctif
- ARM des TSA « premier passage » 30% d'erreur
- Amélioration avec acquisitions dynamiques (remplissage progressif en phases tardives)

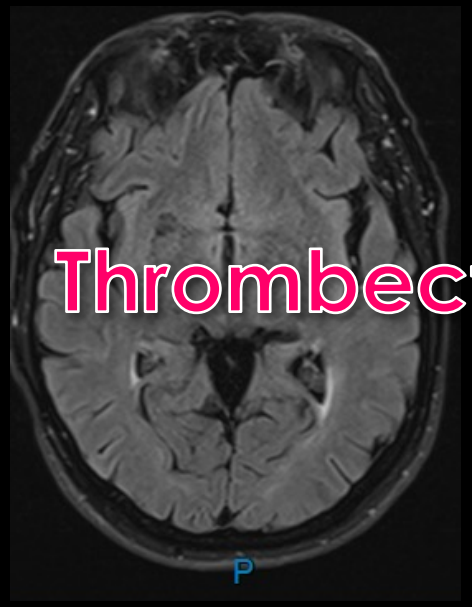



*W Boisseau et al. AJNR 2021*

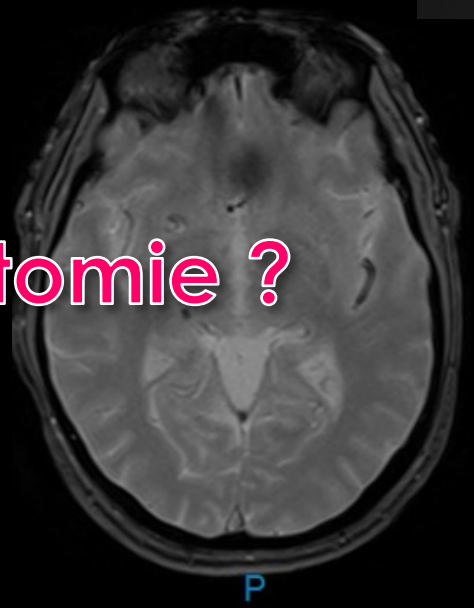
# Cas N°1

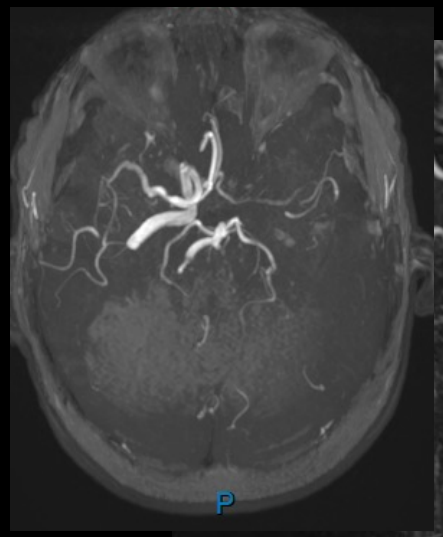
Déficit troubles du langages, aphasie de broca, survenu à 12:30.
Score de NHISS initial : 11.
Réalisation d'une IRM à 14:45. ASPECT : 7
Thrombolyse intraveineuse, par Metalyse, heure de début : 15:20.
Heure de départ du site d'origine : 16:30.
Patient arrivé sur site à 17:36 (H+5). Score de NHISS à l'arrivée : 11.





Thrombectomie ?







Tandem

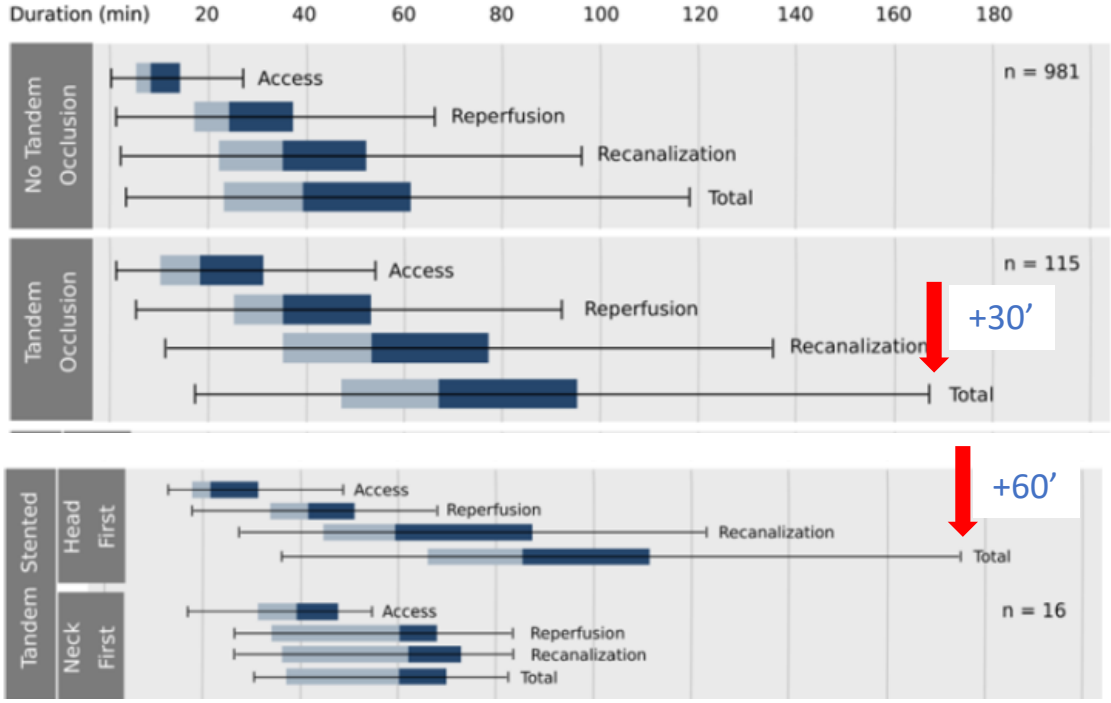
# Objectifs & questions


1. Comment faire le diagnostic ?
2. **Bénéfice de la thrombectomie ?**
3. Quelle stratégie thérapeutique ?

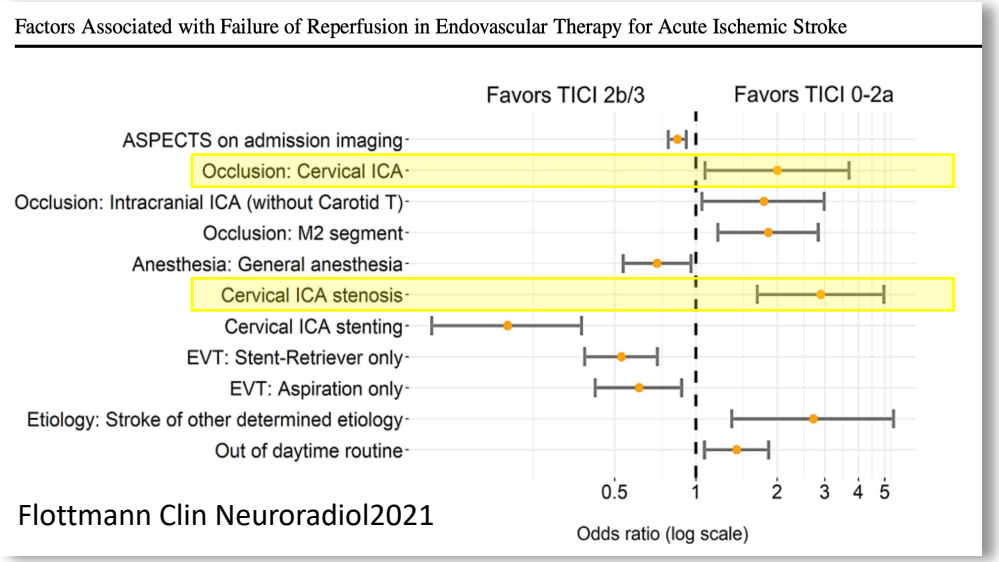
# Bénéfice de la thrombectomie ?

- **Complexité technique**


- **Allongement des délais**




- **Surrisque d'Échec**

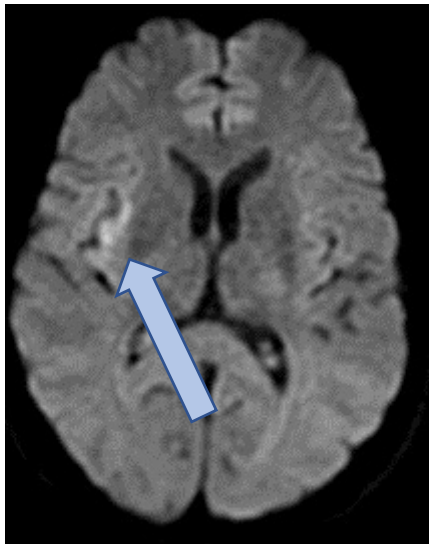


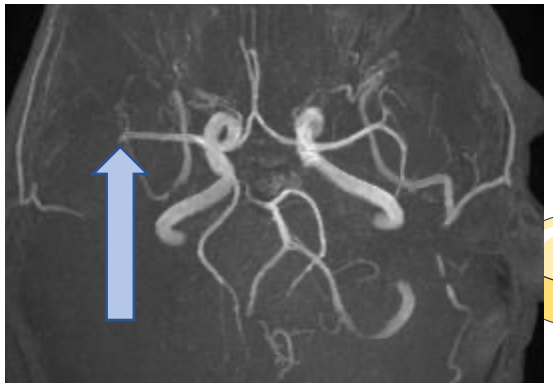

Flottmann Clin Neuroradiol2021

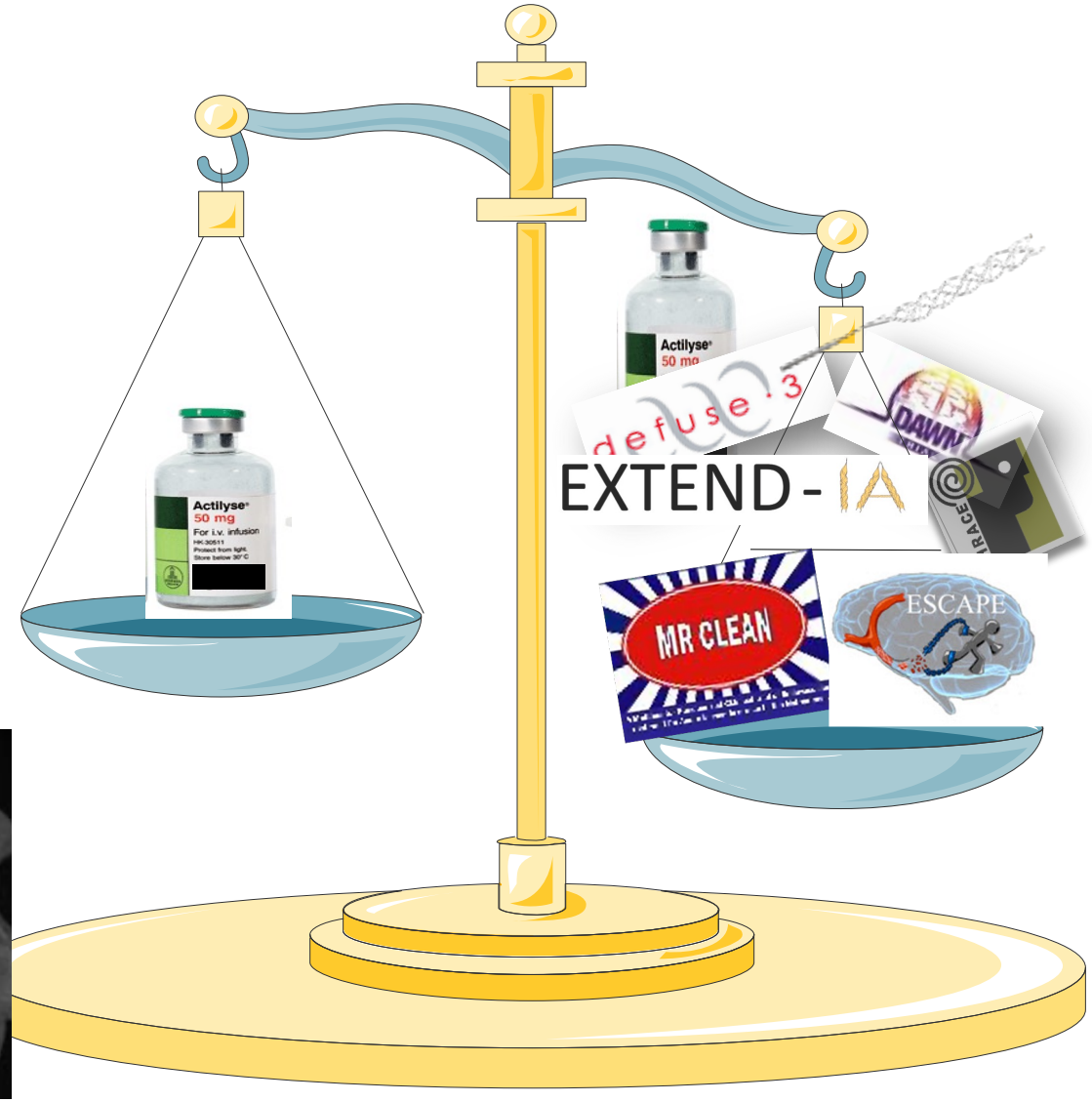
- **Surrisque de complication** (Happi et al, stroke 2021 (ETIS)
  - ENT : OR=5 - 95% CI, 2.03–12.31
  - Perforation : 39.7% Tandem vs 27.6 *P*=0.028

**Thrombectomie ?**

# Bénéfice de la thrombectomie ?



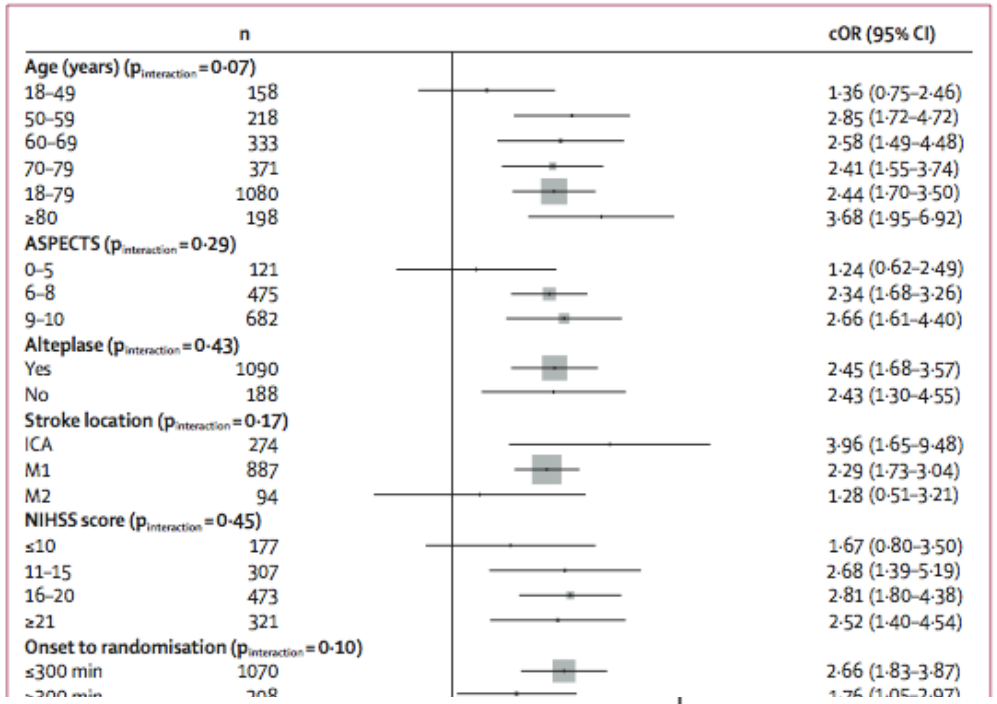





Recommandations ESO/ESMINT 2019

# Bénéfice de la thrombectomie ?

## Donnés des RCT




HERMES Collaborators

Highly Effective Reperfusion evaluated in Multiple Endovascular Stroke trials (HERMES)

ESCAPE REVASCAT MR CLEAN EXTEND-IA SWIFT PRIME

*Lancet 2016; 387: 1723–31*

# Bénéfice de la thrombectomie ?

## Donnés des registres prospectifs

**Original Contribution**

### Emergent Management of Tandem Lesions in Acute Ischemic Stroke
**Analysis of the STRATIS Registry**

Ashutosh P. Jadhav, MD, PhD; Osama O. Zaidat, MD; David S. Liebeskind, MD; Dileep R. Yavagal, MD; Diogo C. Haussen, MD; Frank R. Hellinger Jr, MD, PhD; Reza Jahan, MD; Mouhammad A. Jumaa, MD; Viktor Szeder, MD, PhD, MS; Raul G. Nogueira, MD; Tudor G. Jovin, MD

**Brief Report**

### Emergent Carotid Stenting Plus Thrombectomy After Thrombolysis in Tandem Strokes
**Analysis of the TITAN Registry**

Mohammad Anadani, MD; Alejandro M. Spiotta, MD; Ali Alawieh, PhD; Francis Turjman, MD, PhD; Michel Piotin, MD, PhD; Diogo C. Haussen, MD; Raul G. Nogueira, MD; Panagiotis Papanagiotou, MD, PhD; Adnan H. Siddiqui, MD, PhD; Bertrand Lapergue, MD, PhD; Franziska Dorn, MD; Christophe Cognard, MD, PhD; Marc Ribo, MD, PhD; Marios N. Psychogios, MD, PhD; Marc Antoine Labeyrie, MD; Mikael Mazighi, MD, PhD; Alessandra Biondi, MD, PhD; René Anxionnat, MD, PhD; Serge Bracard, MD; Sébastien Richard, MD, PhD; Benjamin Gory, MD, PhD; on behalf of the TITAN (Thrombectomy In TANdem Lesions) Investigators*

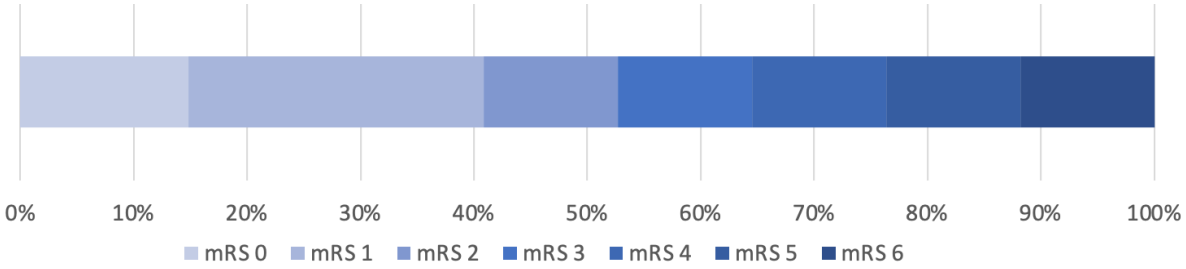
| | TITAN | STRATIS |
|---|---|---|
| Patients | 205 | 147 |
| TICI2B3 | 81% | _ |
| mRs0-2 | 55% | 52% |
| sICH ou PH2 | 7% | 3% |

*Titan & Stratis. Stroke 2019*

HERMES Collaborators

Highly Effective Reperfusion evaluated in Multiple Endovascular Stroke trials (HERMES)

ESCAPE · REVASCAT · VR CLEAN · EXTEND-IA · SWIFT PRIME




**mRS 0-2 : 54%** **sICH : 4.4%**

# Objectifs & questions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3. Quelle stratégie thérapeutique ?

# Objectifs & questions

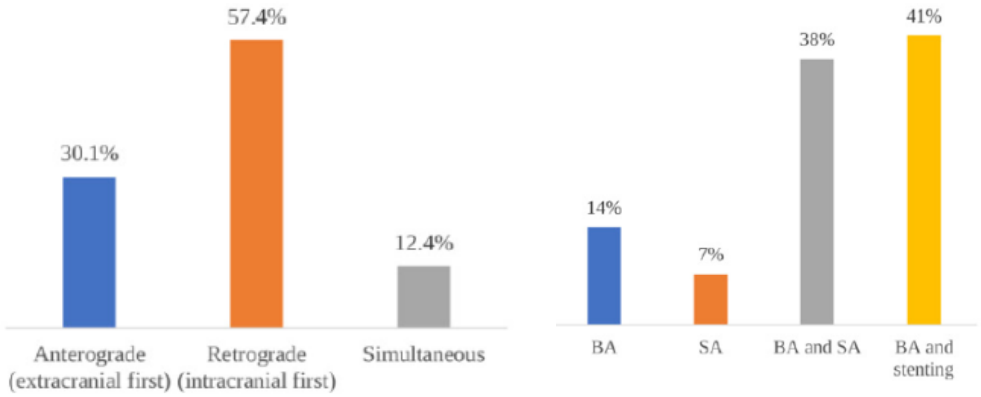

1. Comment faire le diagnostic ?
2. Bénéfice de la thrombectomie ?
3. **Quelle stratégie thérapeutique ?**

# Stratégie thérapeutique :


- Thrombolyse première ?
- Comment passer la sténose ?
- Traiter la pathologie cervicale ?
- Head first or Neck first ?
- Les deux en même temps ?
- Stent ? Lequel ?
- Fluidifiants sanguins après le geste ?

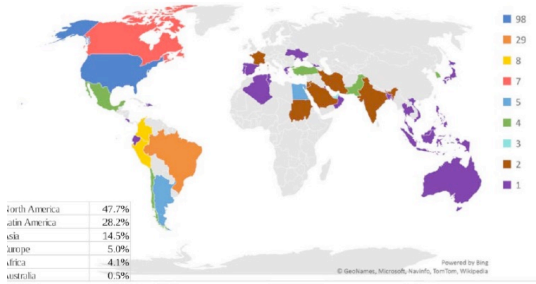
# Stratégie thérapeutique :

Thrombolyse ?
Héparine ?
Head or Neck first ?
Traiter la lésion cervicale ?
AAP ?




## Proximal Internal Carotid artery Acute Stroke Secondary to tandem Occlusions (PICASSO) international survey

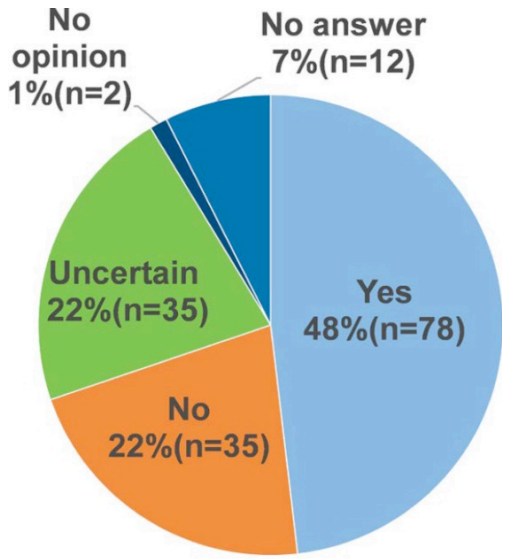
Cynthia B Zevallos [1], Mudassir Farooqui [1], Darko Quispe-Orozco,[1] Alan Mendez-Ruiz,[1] Mary Patterson,[2] Kristine Below,[2] Sheila O Martins,[3] Ossama Y Mansour [4], Francisco Mont'Alverne,[5] Thanh N Nguyen [6], Luis Lemme,[7] Adnan H Siddiqui [8,9], Justin F Fraser [10], Ashutosh P Jadhav,[11] Osama O Zaidat [12], Santiago Ortega-Gutierrez [13]



*Zevallos CB, et al. J NeuroIntervent Surg 2020*

# Stratégie thérapeutique :

Thrombolyse ?
Héparine ?
Head or Neck first ?
Traiter la lésion cervicale ?
AAP ?




**Lack of Consensus Among Stroke Experts on the Optimal Management of Patients With Acute Tandem Occlusion**

Gregory Jacquin, MD*; Alexandre Y. Poppe, MD, CM*; Marilyn Labrie, MD; Nicole Daneault, MD; Yan Deschaintre, MD; Laura C. Gioia, MD; Celine Odier, MD; Jean Raymond, MD; Daniel Roy, MD; Alain Weill, MD; Christian Stapf, MD

*Stroke 2019 Réponses >160*

# Thrombolyse première ?

« Si pas de thrombolyse, plus de liberté pour l'utilisation d'AAP(s) »

**Table 3** Comparisons of clinical and procedural outcomes according to intravenous thrombolysis use in patients treated with carotid artery stenting (secondary analysis) before and after inverse probability of treatment weighting

| Outcomes | IVT− (n=126) | IVT+ (n=214) | Before IPTW | | After IPTW | |
|---|---|---|---|---|---|---|
| | | | Effect size (95% CI) | P value | Effect size (95% CI) | P value |
| **Clinical outcomes** | | | | | | |
| Favorable outcome* | 62 (49.2) | 130 (60.7) | 1.59 (1.01 to 2.50) | 0.043 | 1.11 (1.01 to 1.24) | 0.049 |
| Excellent outcome† | 42 (33.3) | 94 (43.9) | 1.58 (0.99 to 2.51) | 0.054 | 1.09 (0.98 to 1.21) | 0.10 |
| 90-Day mortality | 24 (19.0) | 16 (7.5) | 0.35 (0.17 to 0.69) | 0.002 | 0.90 (0.84 to 0.97) | 0.005 |
| Hemorrhagic complications | | | | | | |
| sICH | 11 (8.7) | 16 (7.5) | 0.83 (0.37 to 1.85) | 0.64 | 0.98 (0.92 to 1.04) | 0.47 |
| PH2 | 10 (7.9) | 12 (5.6) | 0.66 (0.27 to 1.59) | 0.35 | 0.96 (0.91 to 1.02) | 0.16 |
| 24-Hour NIHSS score shift, median (IQR) | 0.0 (−5.0–2.0) | −4.0 (−9.0–0.0) | −3.2 (−5.9 to −0.5) | 0.022 | −3.0 (−5.6 to −0.3) | 0.030 |
| 24-Hour ASPECTS shift, median (IQR) | −2.0 (−4.0–0.0) | −1.0 (−3.0–0.0) | 0.5 (−0.05 to 1.0) | 0.072 | 0.6 (0.07 to 1.2) | 0.026 |
| **Procedural outcomes** | | | | | | |
| Successful reperfusion‡ | 102 (81.0) | 182 (85.0) | 1.34 (0.75 to 2.40) | 0.33 | 1.05 (0.97 to 1.14) | 0.22 |
| Excellent reperfusion§ | 38 (30.2) | 72 (33.6) | 1.15 (0.72 to 1.84) | 0.55 | 1.04 (0.94 to 1.15) | 0.48 |
| Procedural complication | 12 (9.5) | 25 (11.7) | 1.26 (0.61 to 2.61) | 0.53 | 1.03 (0.96 to 1.10) | 0.45 |

Values are expressed as number (%) unless otherwise indicated

La thrombolyse est incontournable

Pas d'augmentation du risque de la TM

*Anadani M. et al. Stroke 2019 & JNIS 2021*

# Comment passer la sténose ?

**Reasons for Reperfusion Failures in Stent-Retriever-Based Thrombectomy: Registry Analysis and Proposal of a Classification System**

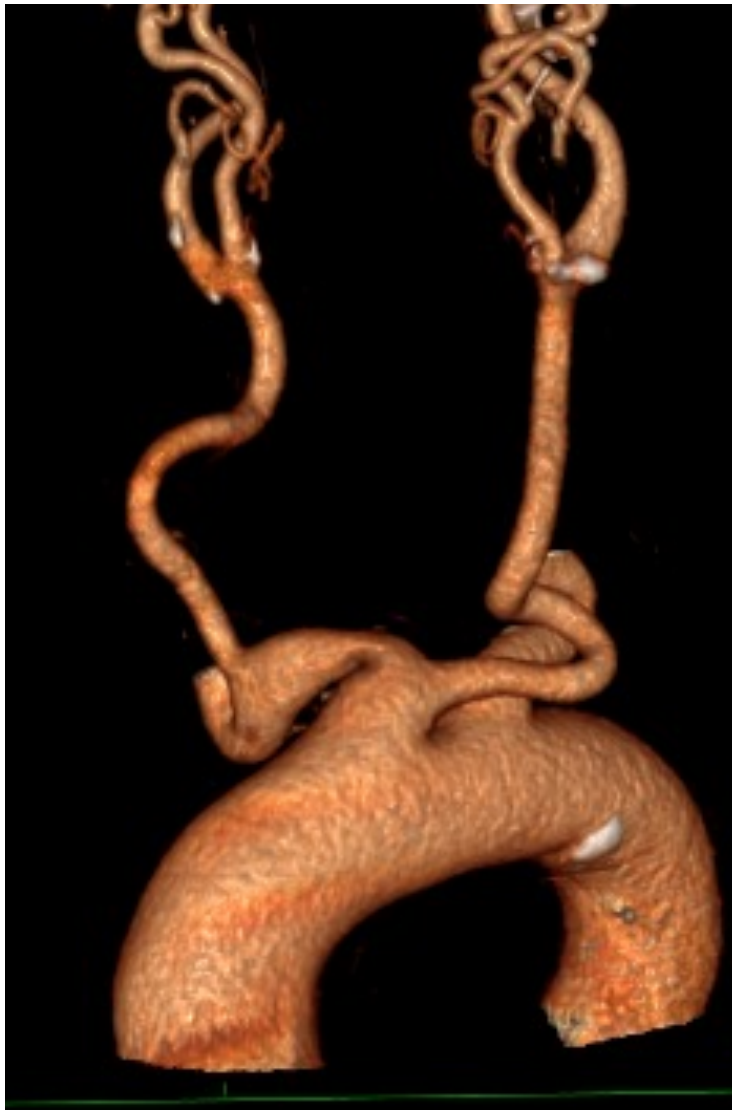
J. Kaesmacher, J. Gralla, P.J. Mosimann, F. Zibold, M.R. Heldner, E. Piechowiak, T. Dobrocky, M. Arnold, U. Fischer, and P. Mordasini

Peut être difficile ++++

Echec de TM (63/592) car occlusion non atteinte (20) :

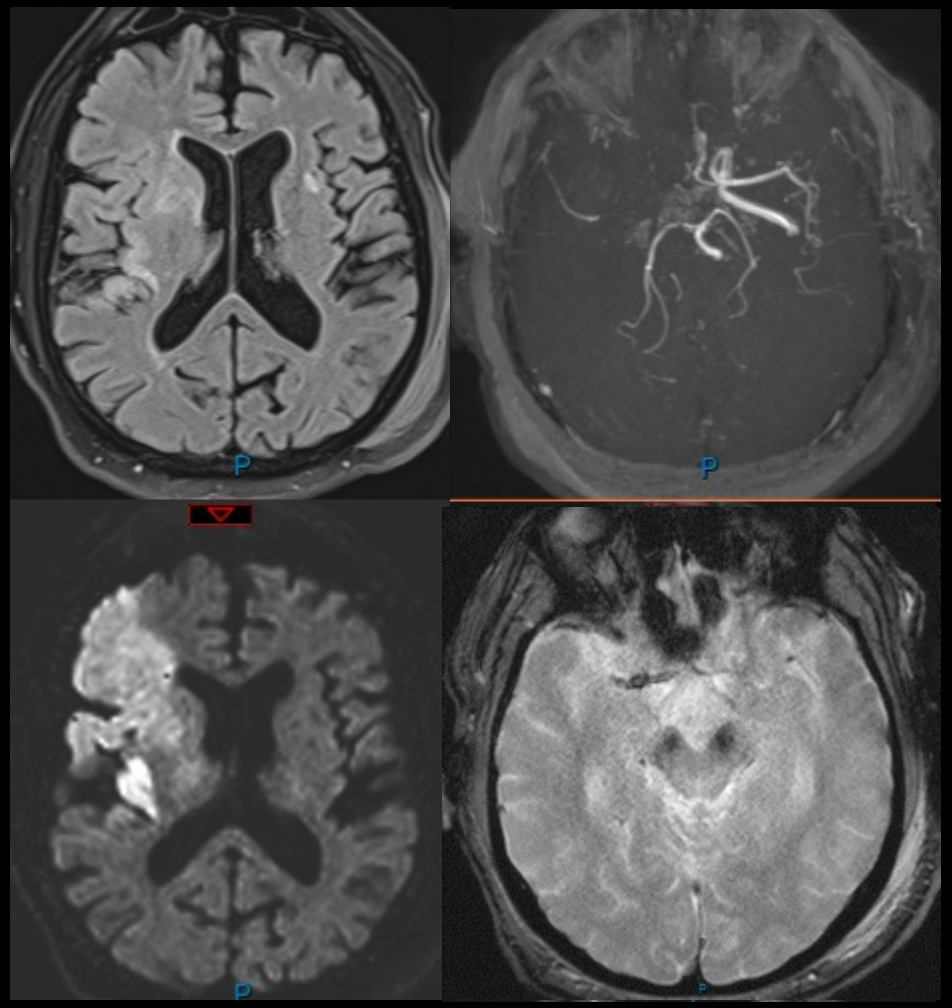
- tortuosité TSA (10/20)
- tortuosité cervicale (8/20)
- Occlusion cervicale (2/20)

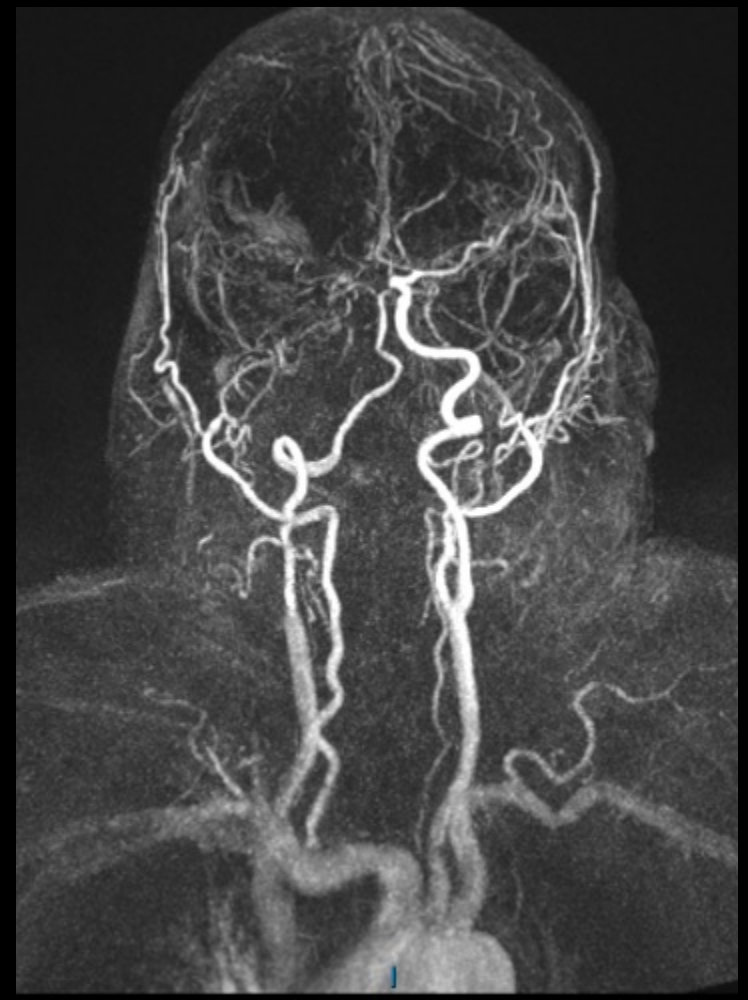
*AJNR 2018 n=63/592*



# Cas N°2

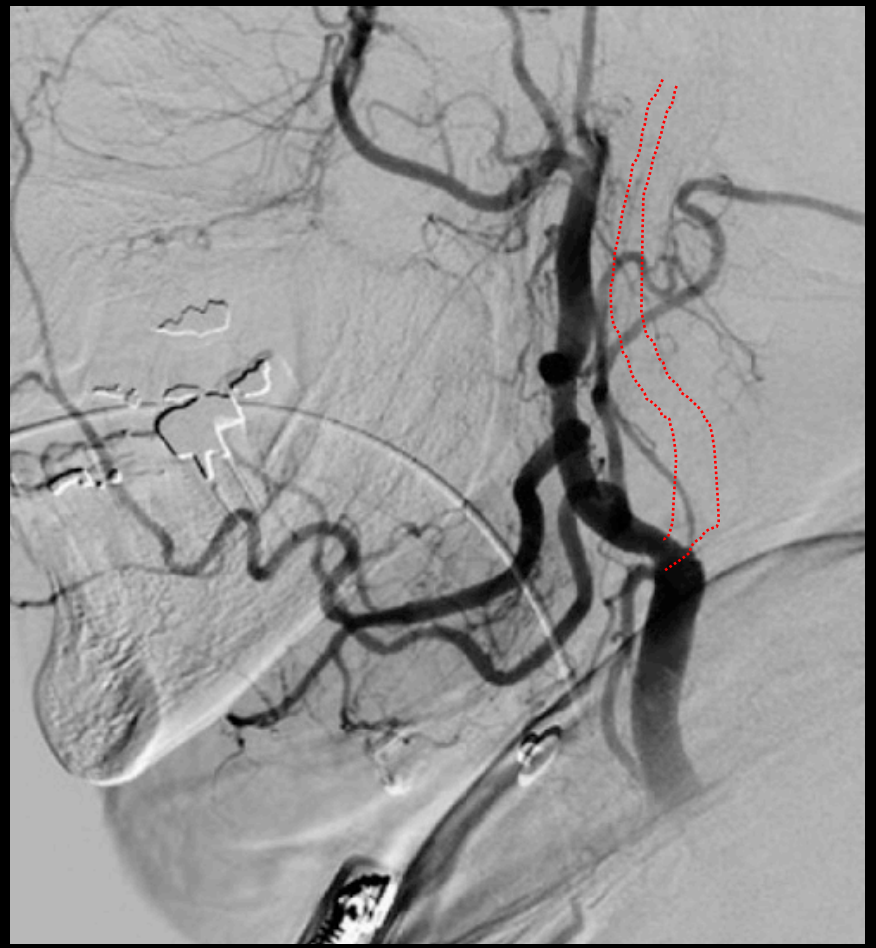
Déficit de l'hémicorps gauche, troubles de la conscience, HLH troubles du langages.
dernière fois vu normal :  23:00.
Score de NHISS initial : 17.
IRM, à 12:47. ASPECT : 6
Heure de départ du site d'origine : 13:25.
Patient arrivé sur site à 14:00.
Score de NHISS à l'arrivée : 17.
Pas de thrombolyse intraveineuse : Délai





# Cas N°2

Peut être difficile ++++



# Comment passer la sténose ?

## Passage « en force » avec les gros KT

**The Dilator-Dotter Technique: A Modified Method of Rapid Internal Carotid Artery Revascularization in Acute Ischemic Stroke**

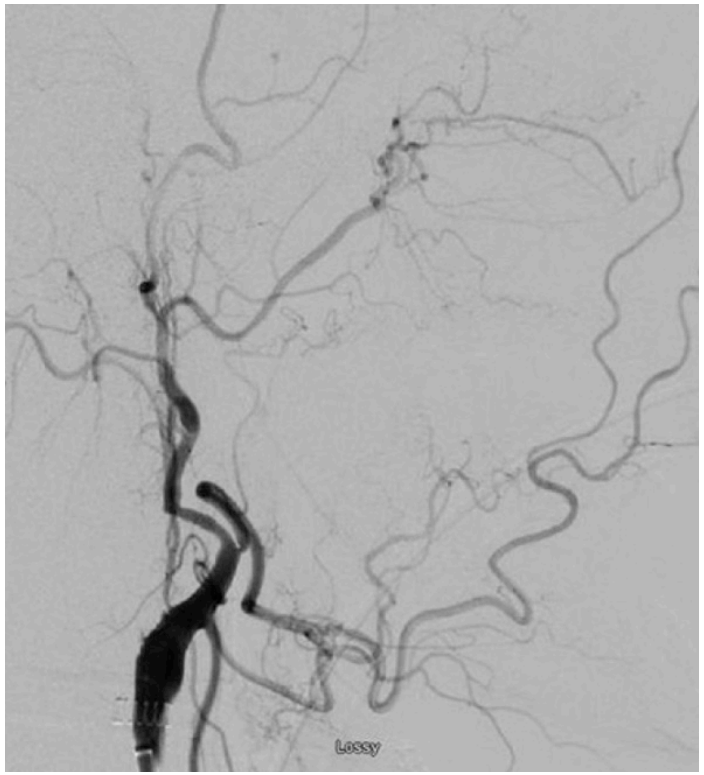
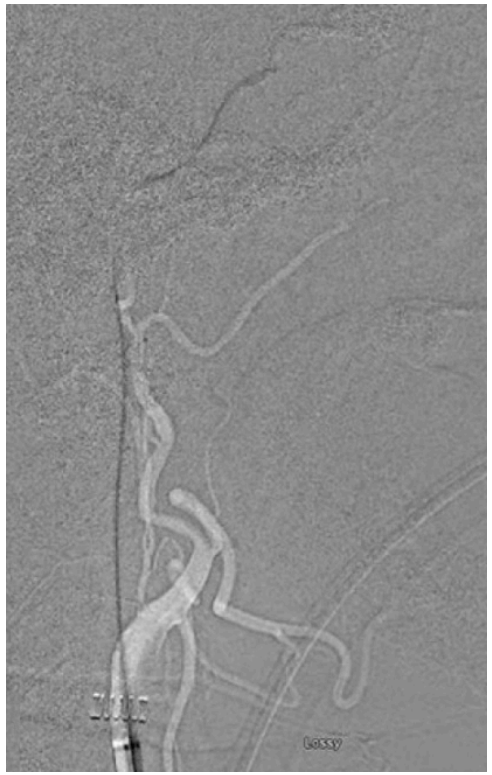
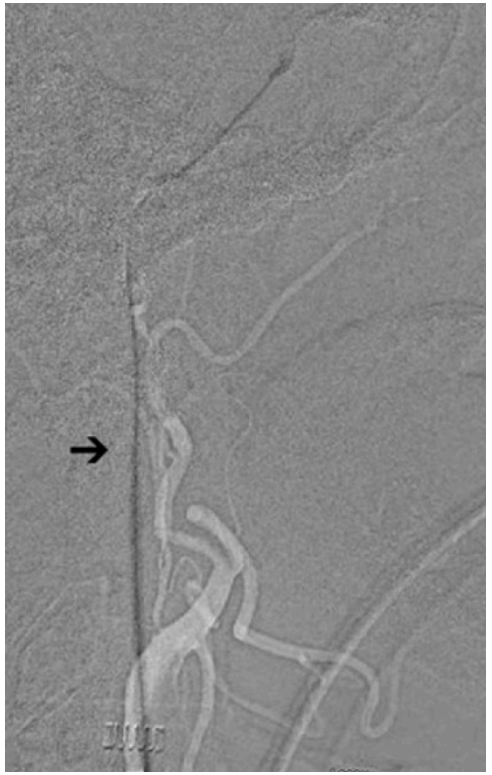
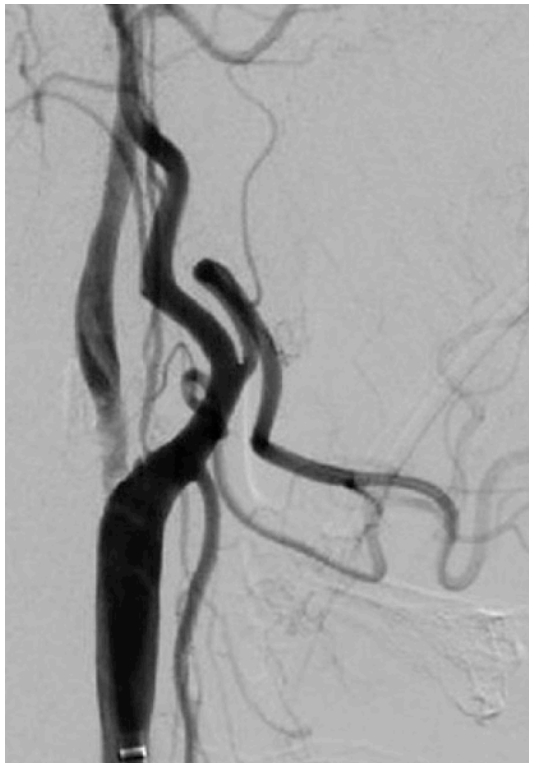
K. Amuluru, D. Sahlein, F. Al-Mufti, T. Payner, C. Kulwin, A. DeNardo, and J. Scott

Fémoral ou radial
6F 90 cm introducteur long 088
Guide 0.035
Retrait du catheter diag Sim ou Ber
Remise en place du dilatateur sur le 35
Puis du 088
Aspiration continue pendant et après retrait du dilatateur

*AJNR 2020 n=32 100% de franchissement durée de procédure 25'*

# Comment passer la sténose ?

## Passage « en force » avec les gros KT

*AJNR 2020  n=32 100% de franchissement durée de procédure 25'*

# Comment passer la sténose ?

## Passage « en force » avec les gros KT

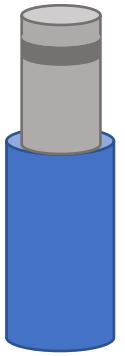
Fémoral ou M sup

Passage de l'occlusion successivement par

KT diagnostic Berenstein ou Simmons Diag 6F

Puis introducteur long 6F 90 cm 088

En aspiration continue



KT 6F
Sim-Ber

6F 0.88''

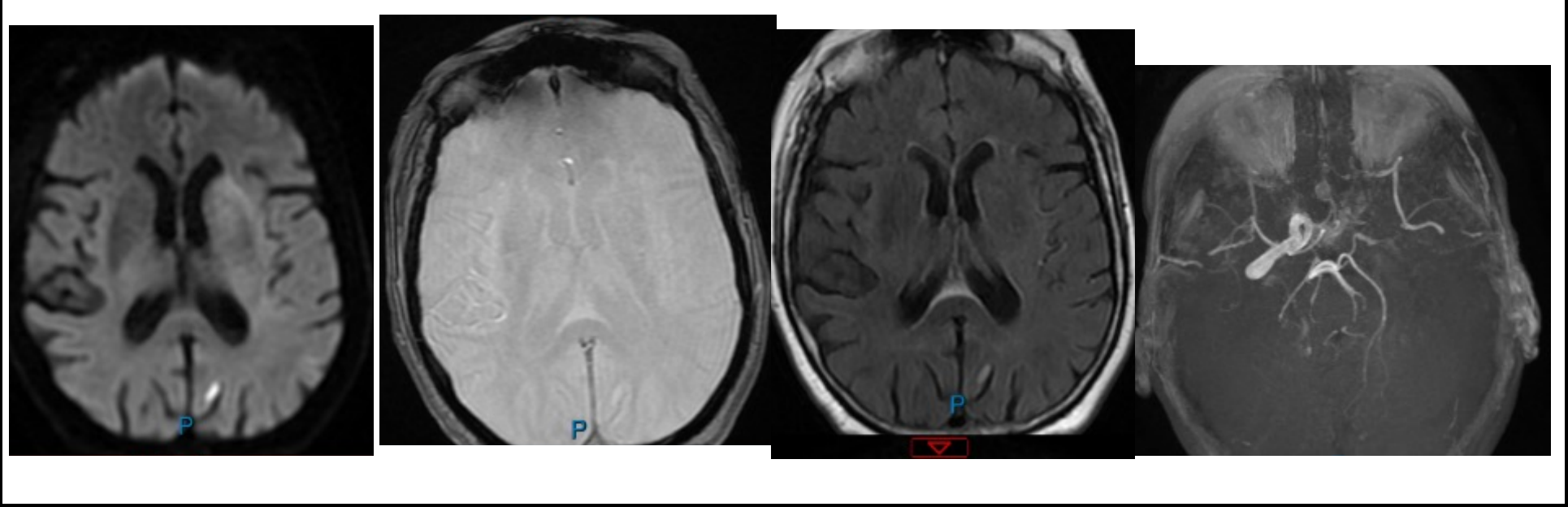
CASE SERIES

The Dotter method revisited: early experience with a novel method of rapid internal carotid artery revascularization in the setting of acute ischemic stroke

Keith Woodward,[1] Scott Wegryn,[1] Carla Staruk,[2] Eric M Nyberg[3]

# Cas N°3

Patiente de 77 ans
Déficit de l'hémicorps droit, survenue à 14:00
Score de NHISS initial : 8.
Patiente arrivée sur site à 16:40. Réalisation d'une IRM à 16:43
Pas de thrombolyse intraveineuse : chirurgie récente (pontage coronarien)-
*Entrée en salle à 17:10.*



Patiente de 77 ans

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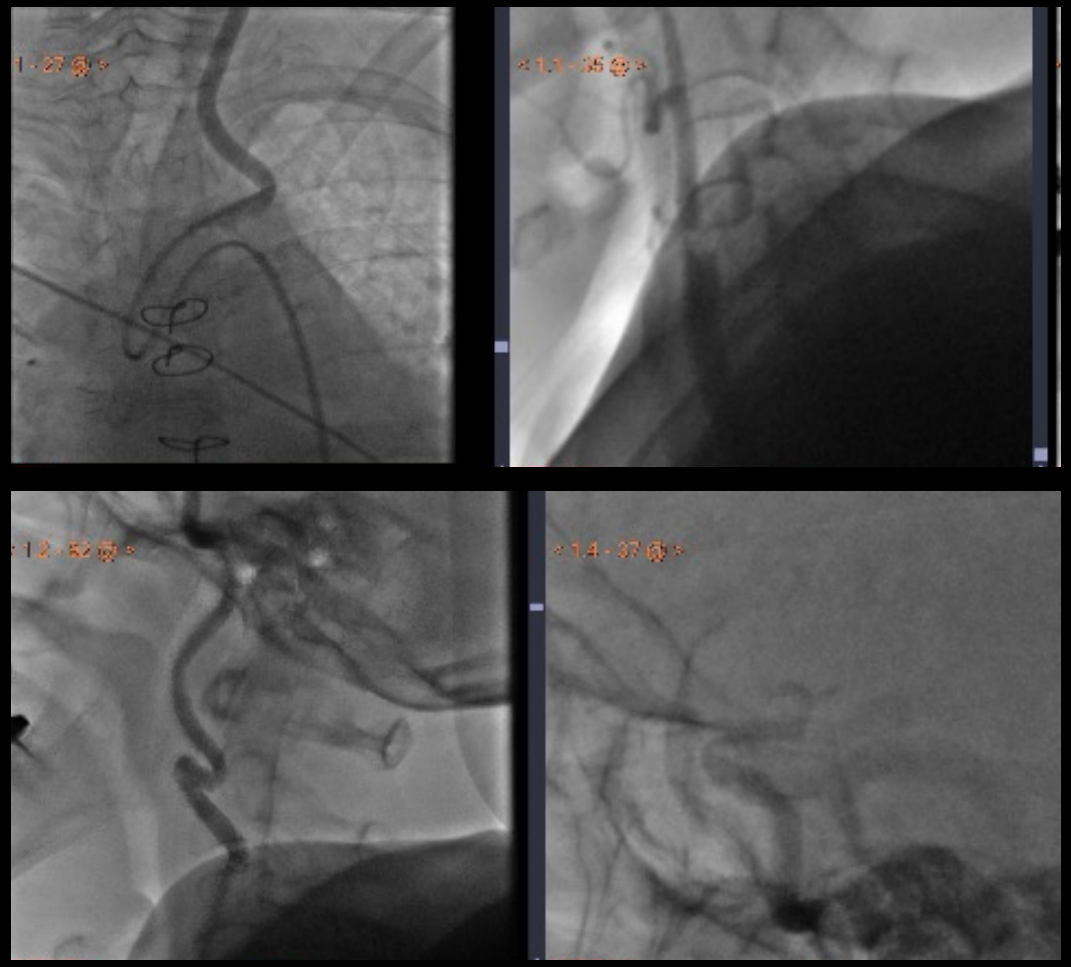
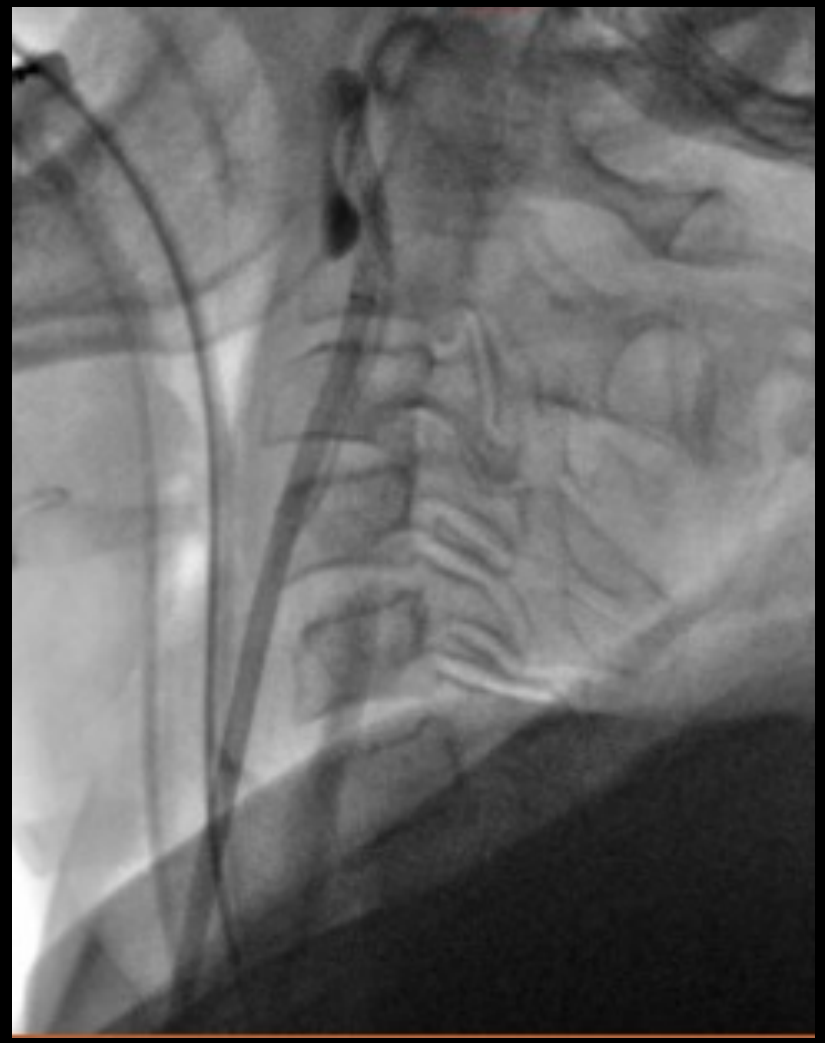
Pas de thrombolyse intraveineuse : chirurgie récente (pontage coronarien)-

*Entrée en salle à 17:10.  Ponction à 17:18.*





Patiente de 77 ans

Déficit de l'hémicorps droit, survenue à 14:00

Score de NHISS initial : 8.

Patiente arrivée sur site à 16:40. Réalisation d'une IRM à 16:43

Pas de thrombolyse intraveineuse : chirurgie récente (pontage coronarien)-

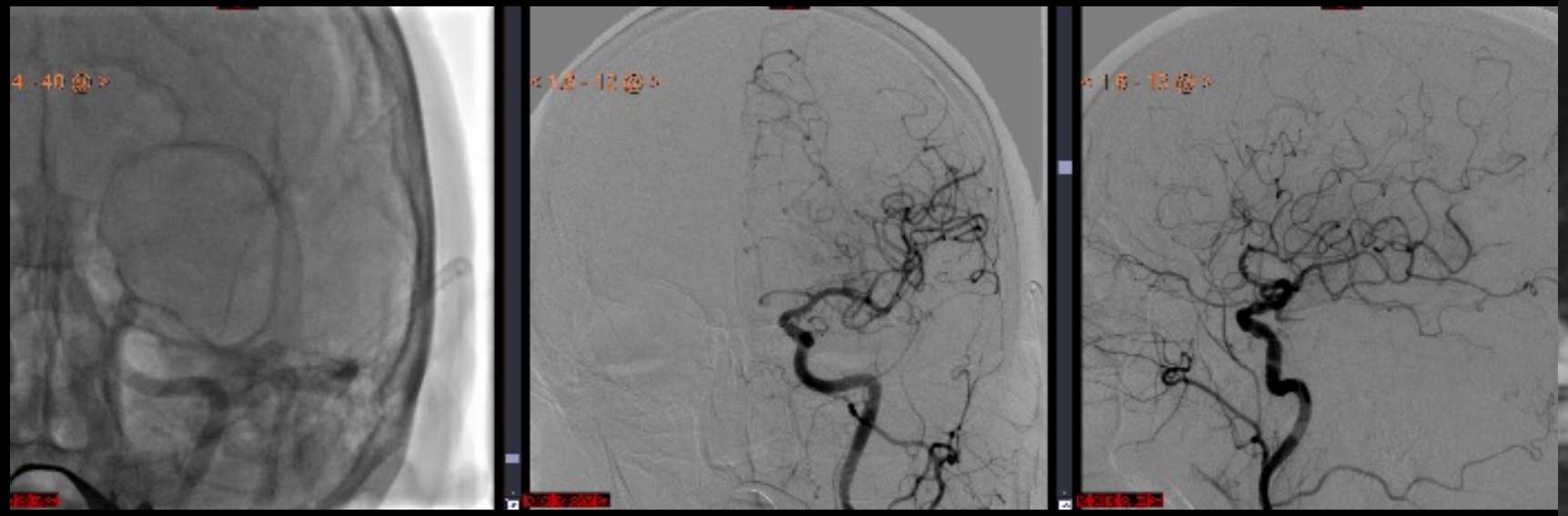
*Entrée en salle à 17:10.  Ponction à 17:18.*

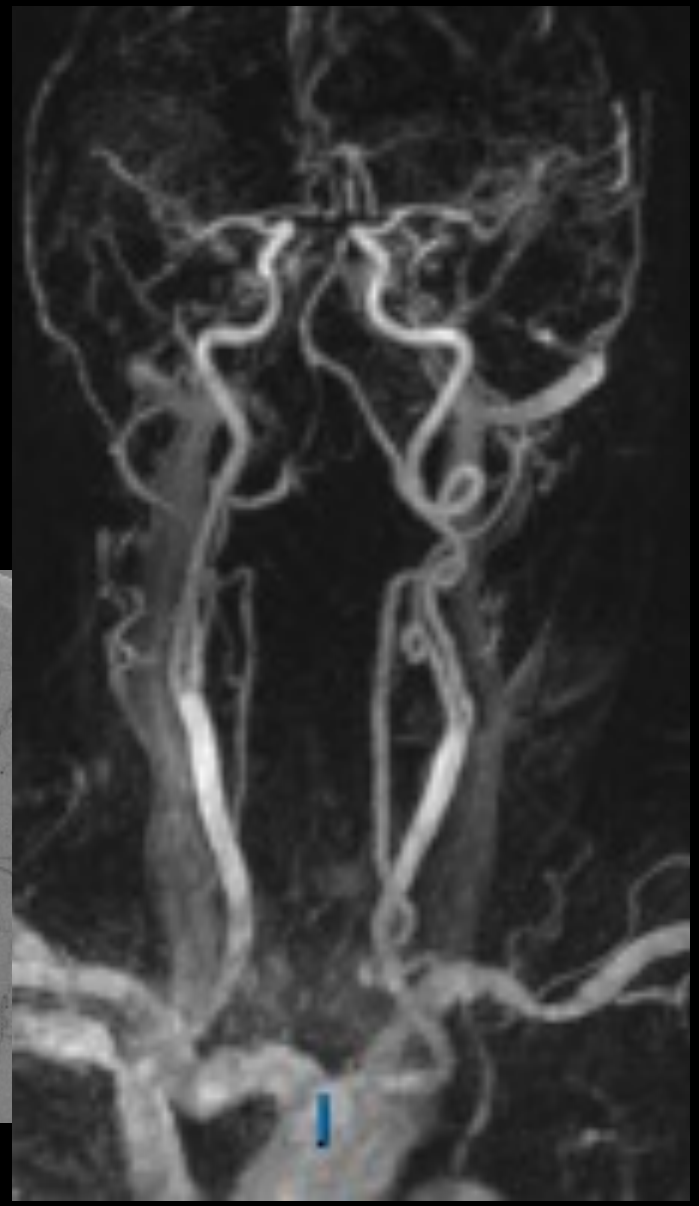
*Montée en aspiration*

*Technique combinée*

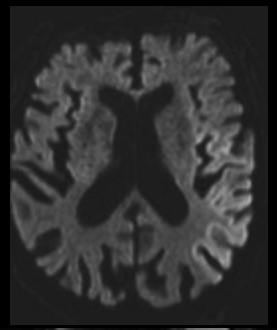
**Résultat final TICI2B obtenu à 17:47.**

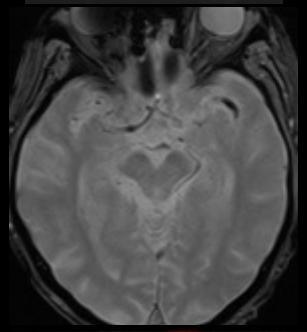
Attente 20’ : lésion cervicale stable

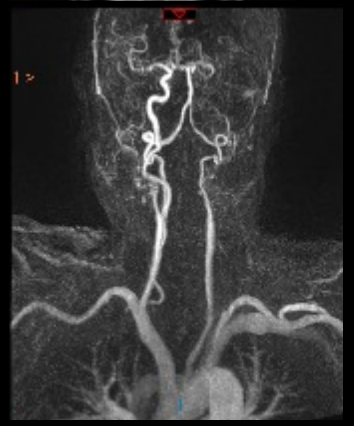


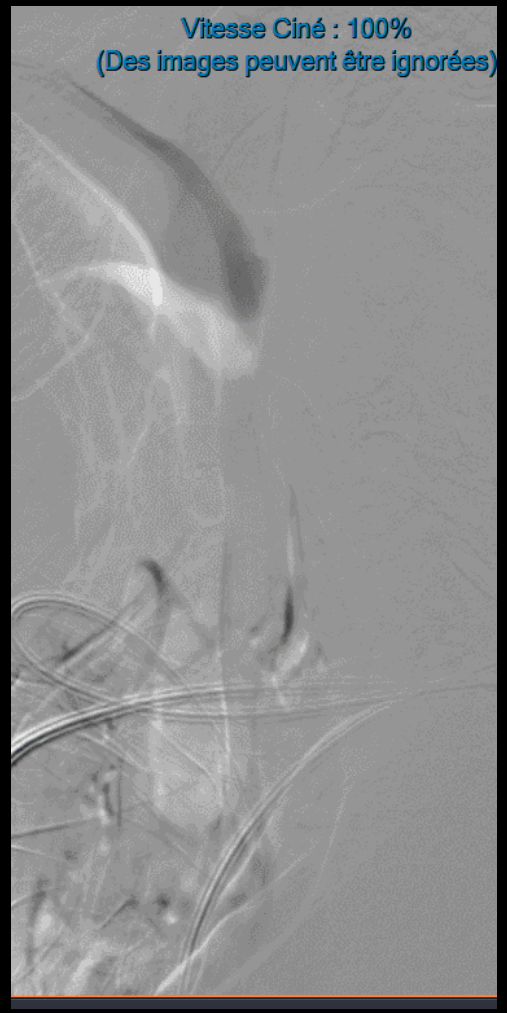


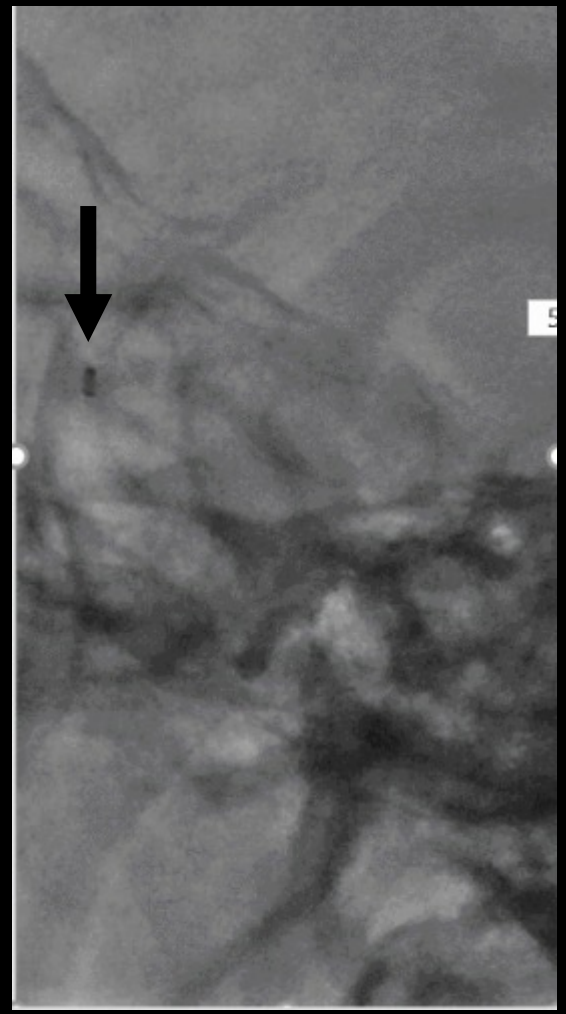
Patient de 78 ans Traitement : HTA - AC/FA sous préviscan. INR 1.49.
Déficit de l'hémicorps droit, troubles du langages, survenu à 14:10.
Score de NHISS initial : 16.
Thrombolyse intraveineuse, par Actilyse, heure de début : 16:21.
Heure de départ du site d'origine : 17H30
Score de NHISS à l'arrivée : 16. Patient arrivé sur site à 19:10. montée en aspiration



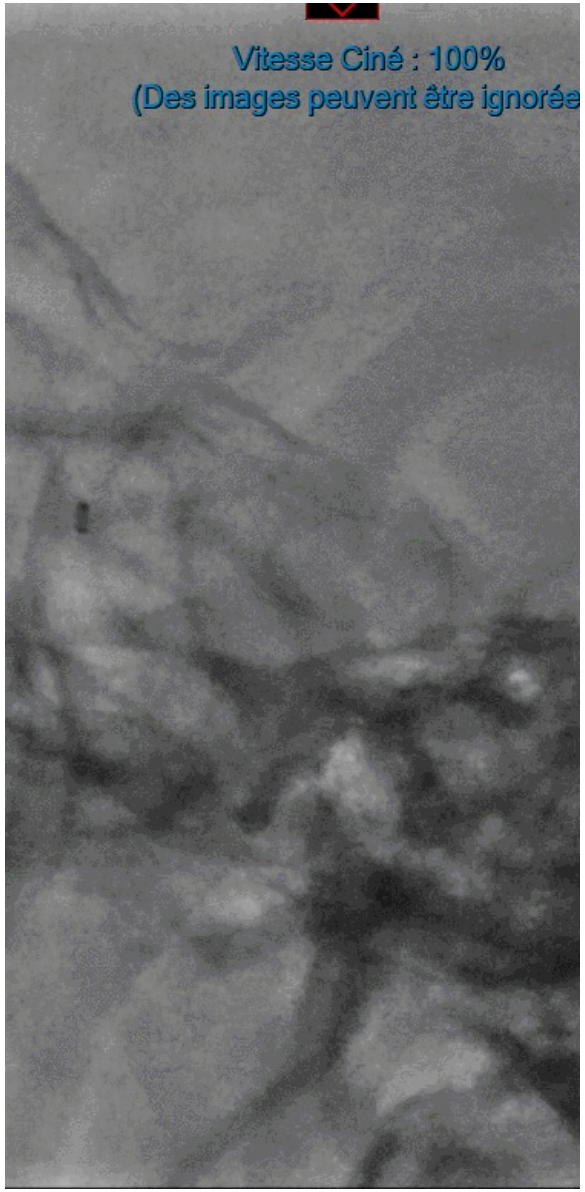


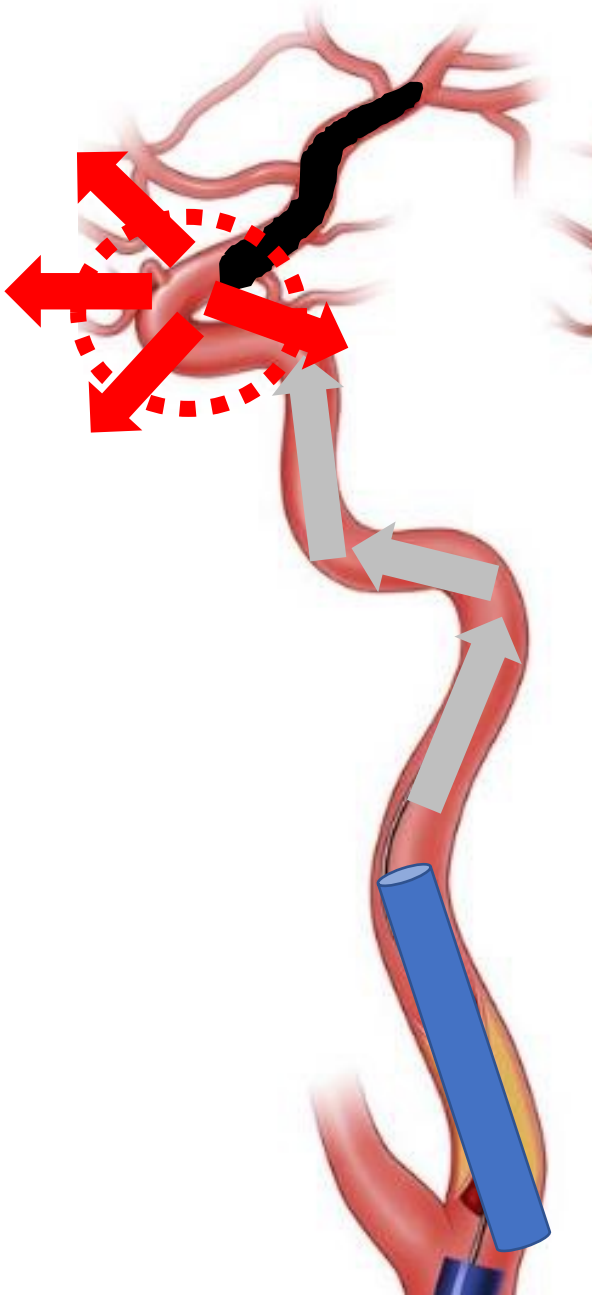




Pas d’injection « tonique » ! Risque de « rupture » de la carotide
Laisser le flush rincer la colonne de contraste

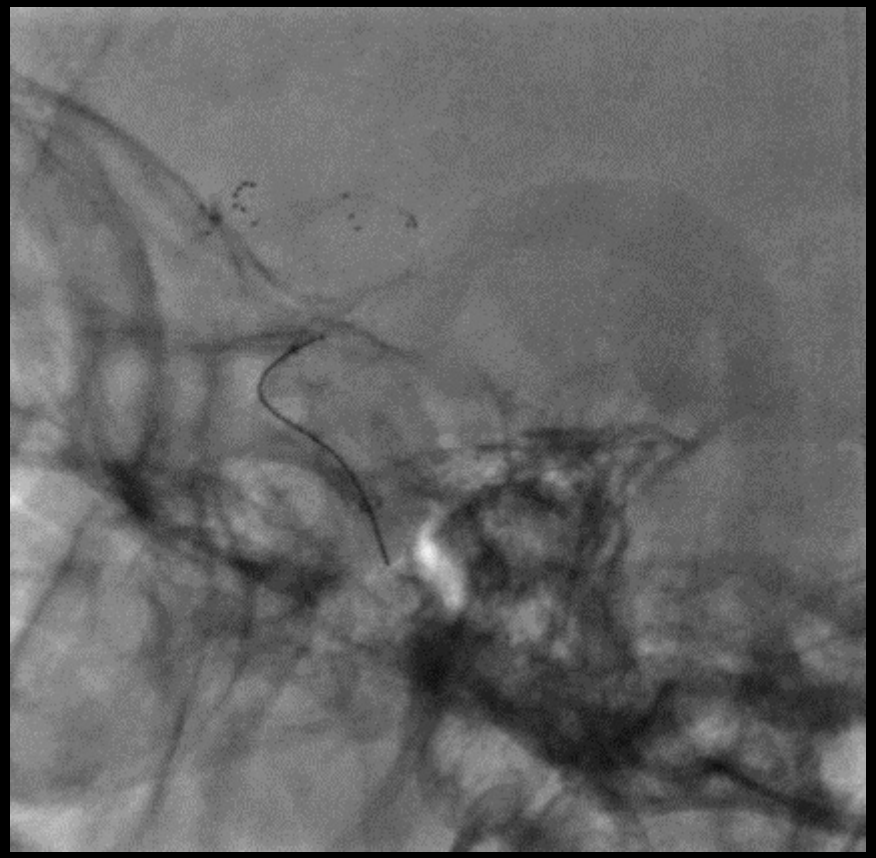


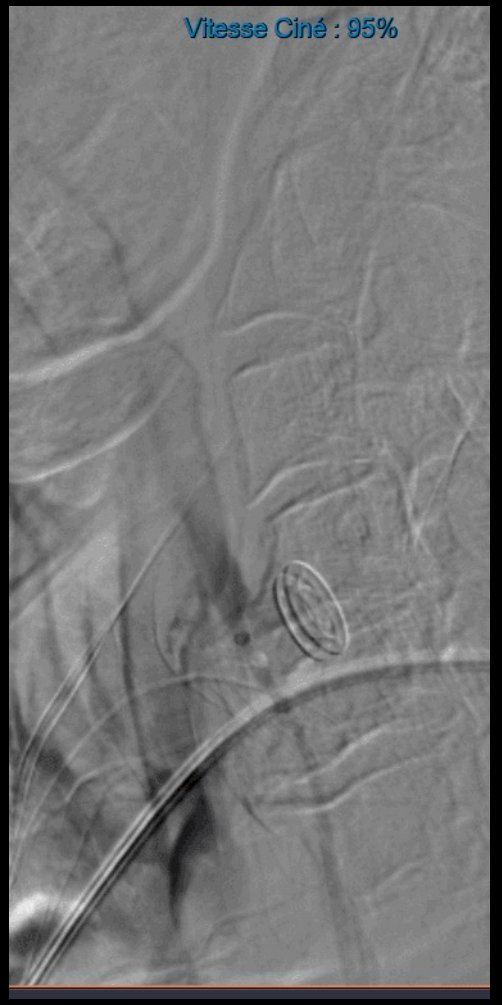



KT Aspi
X 68-71

6F 0.88’’

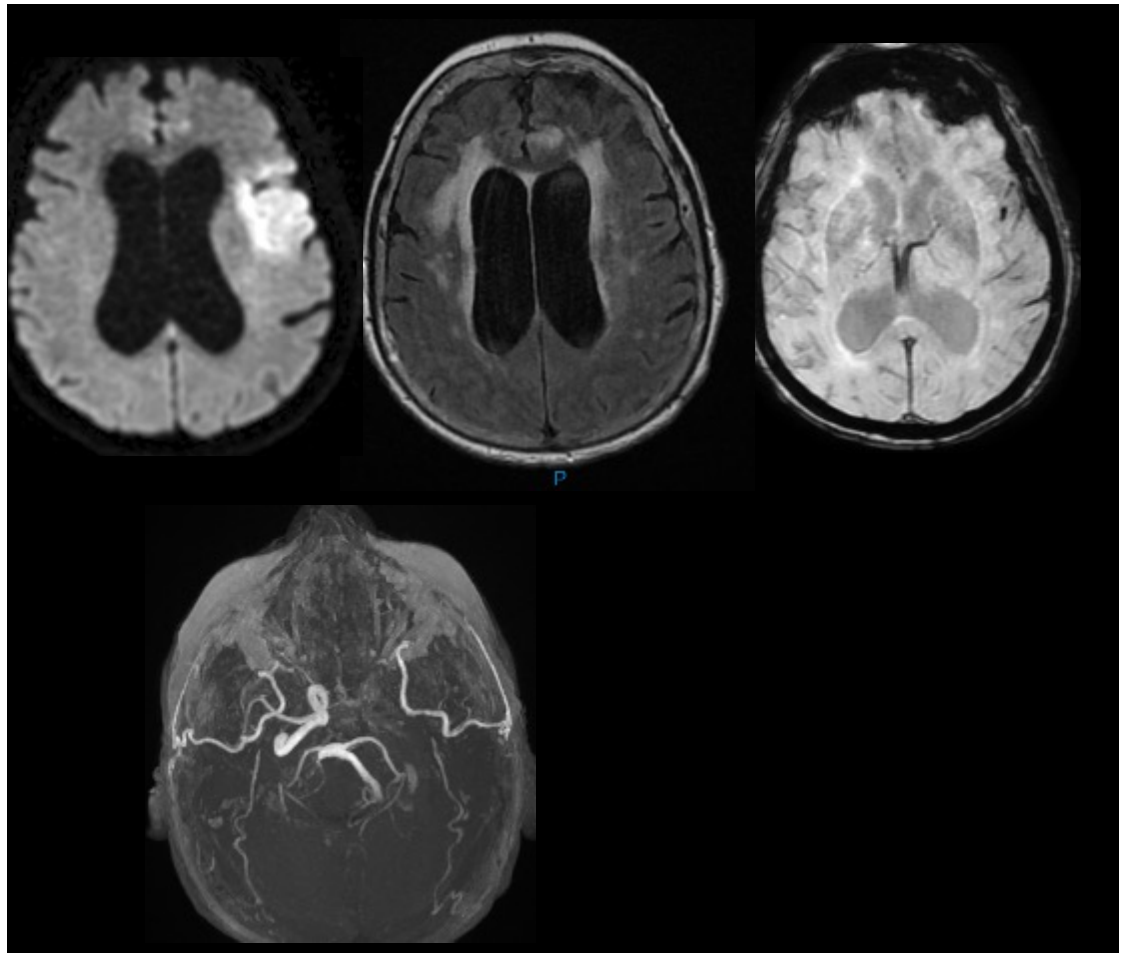
Traitement : HTA - AC/FA sous préviscan. INR 1.49.
Clinique Déficit de l'hémicorps gauche, troubles du langages, survenu à 14:10.
Score de NHISS initial : 16.
Thrombolyse intraveineuse, par Actilyse, heure de début : 16:21.
Heure de départ du site d'origine : 17H30
Score de NHISS à l'arrivée : 16. Patient arrivé sur site à 19:10.
**Recanalisation TICI2B à 19H40 (5H30)**

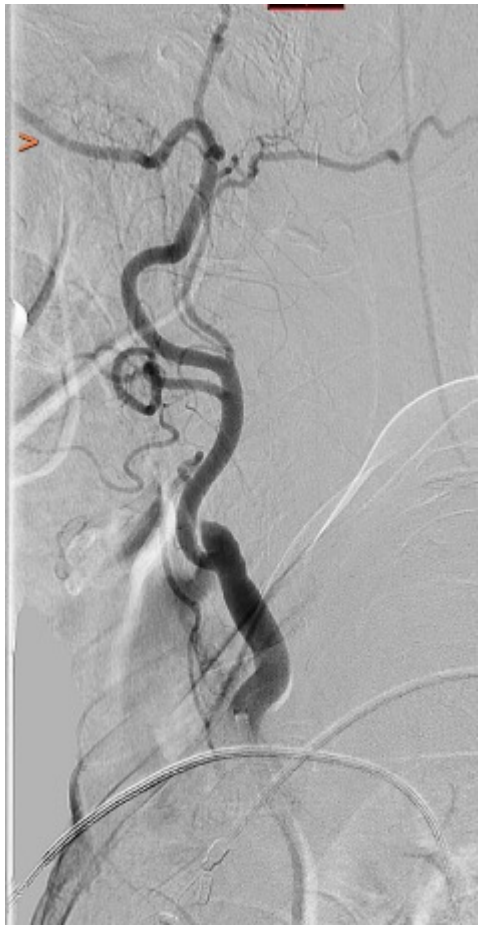


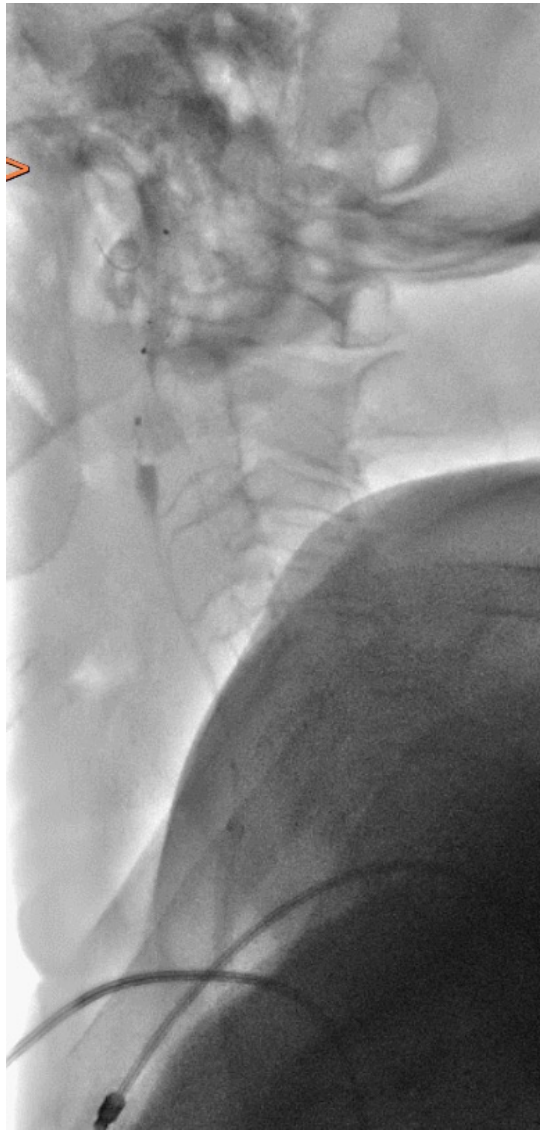


# Comment passer la sténose ?

## Ballon d'angioplastie

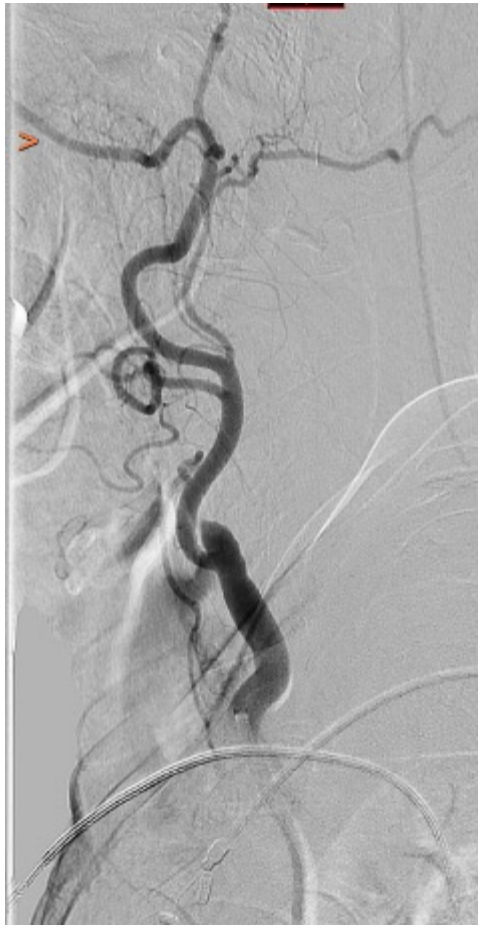


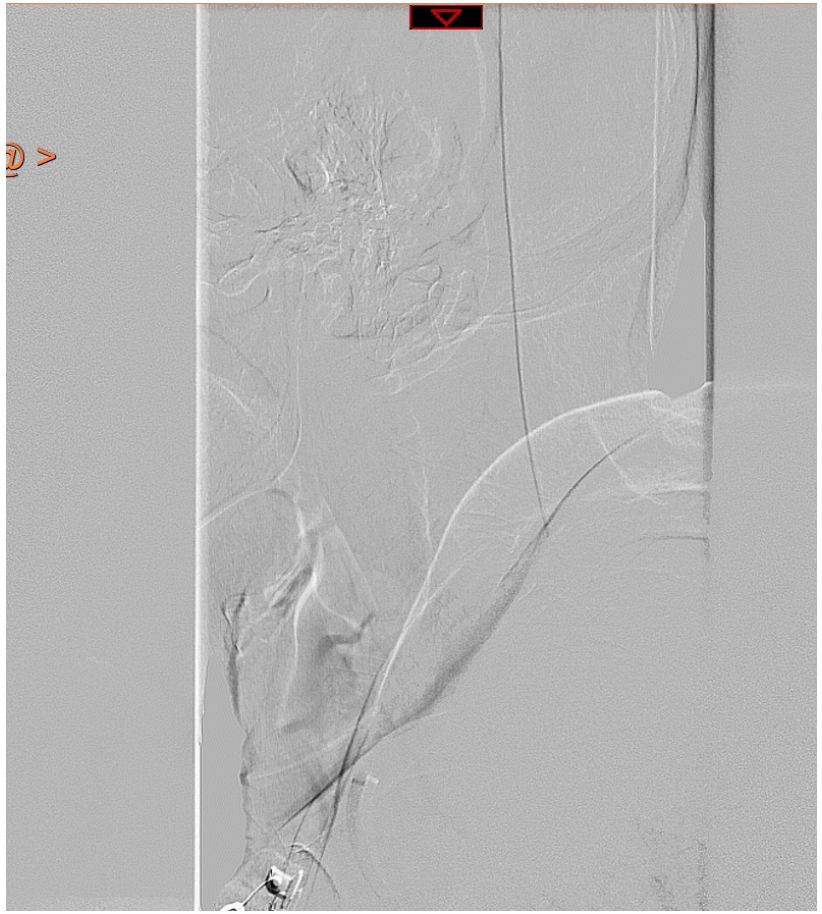




# Comment passer la sténose ?

## Ballon d'angioplastie





# Stenting carotidien ?

**Stenting**

- Plus de complications hgiques
- Thrombose intra stent
- Embol artère-artère
- Instabilité hémodynamique lors du déploiement

**Pas de Stenting**

- Re-occlusion
- Stroke recurrence
- Progression de l'AVC

| | Stenters; N=96 | Nonstenters*; N=66 | *P* Value |
|---|---|---|---|
| Speciality | | | |
| Stroke neurology | 43 (44.8%) | 22 (33.3%) | 0.14 |
| Radiology | 25 (26.0%) | 13 (19.7%) | 0.34 |
| Neurosurgery | 11 (11.5%) | 14 (21.2%) | 0.09 |
| Interventional neuroradiology | 43 (44.8%) | 31 (47.0%) | 0.78 |
| Others | 10 (10.4%) | 8 (12.1%) | 0.73 |
| Country of practice | | | |
| Canada | 50 (52.1%) | 45 (68.1%) | 0.04 |
| United States | 30 (31.3%) | 12 (18.2%) | 0.06 |
| Others | 16 (16.7%) | 9 (13.6%) | 0.59 |
| Years of practice | | | |
| 0–5 | 34 (35.4%) | 15 (22.7%) | 0.08 |
| 5–15 | 32 (33.3%) | 26 (39.4%) | 0.42 |
| >15 | 30 (31.3%) | 25 (37.9%) | 0.38 |

URL: https://www.clinicaltrials.gov

NCT03978988 **TITAN**

NCT04261478 **EASI-TOC**

*Catanese L et al. Stroke 2021 : a tale of 2 treatments*

*Jacquin G et al Stroke 2019*

# Stenting carotidien ?


URL: https://www.clinicaltrials.gov
NCT03978988

TITAN TRIAL

Symptoms ONSET

Brain Imaging CT/MRI

ASPECTS (CT or DWI) ≥ 5
**and**
LVO (ICA±M1+M2)+cervical carotid lesion (occlusion/stenosis≥90%)

Post-Imaging NIHSS ≥ 6

RANDOMISATION (1:1)

IV thrombolysis if eligible

Symptoms onset to groin <8H

**THROMBECTOMY and CAROTID STENTING*
+
ANTIPLATELET (Aspirin 250mg IV)**

- ✓ 24H NIHSS / CT-CTA or MRI-MRA
- ✓ 90-day mRS[1]
- ✓ 1-year mRS[1]

**THROMBECTOMY ALONE***

- ✓ 24H NIHSS / CT-CTA or MRI-MRA
- ✓ 90-day mRS[1]
- ✓ 1-year mRS[1]

*imaging core-lab
[1]blinded assessment

# Stenting carotidien ?


URL: https://www.clinicaltrials.gov
NCT03978988

## Suivi mensuel n°24 : Décembre 2022

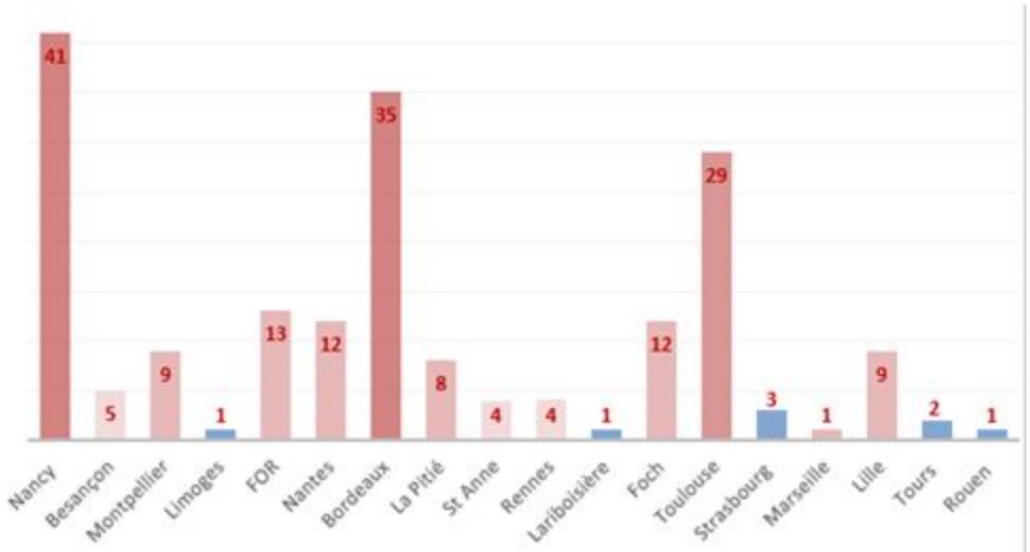
**Chères équipes investigatrices,**

Nous vous souhaitons nos meilleurs vœux pour 2023, et de la réussite dans vos projets.

Au 31 décembre 2022, **190** patients sont inclus dans l'étude TITAN, soit **44% de l'objectif atteint.**

**190 patients inclus**

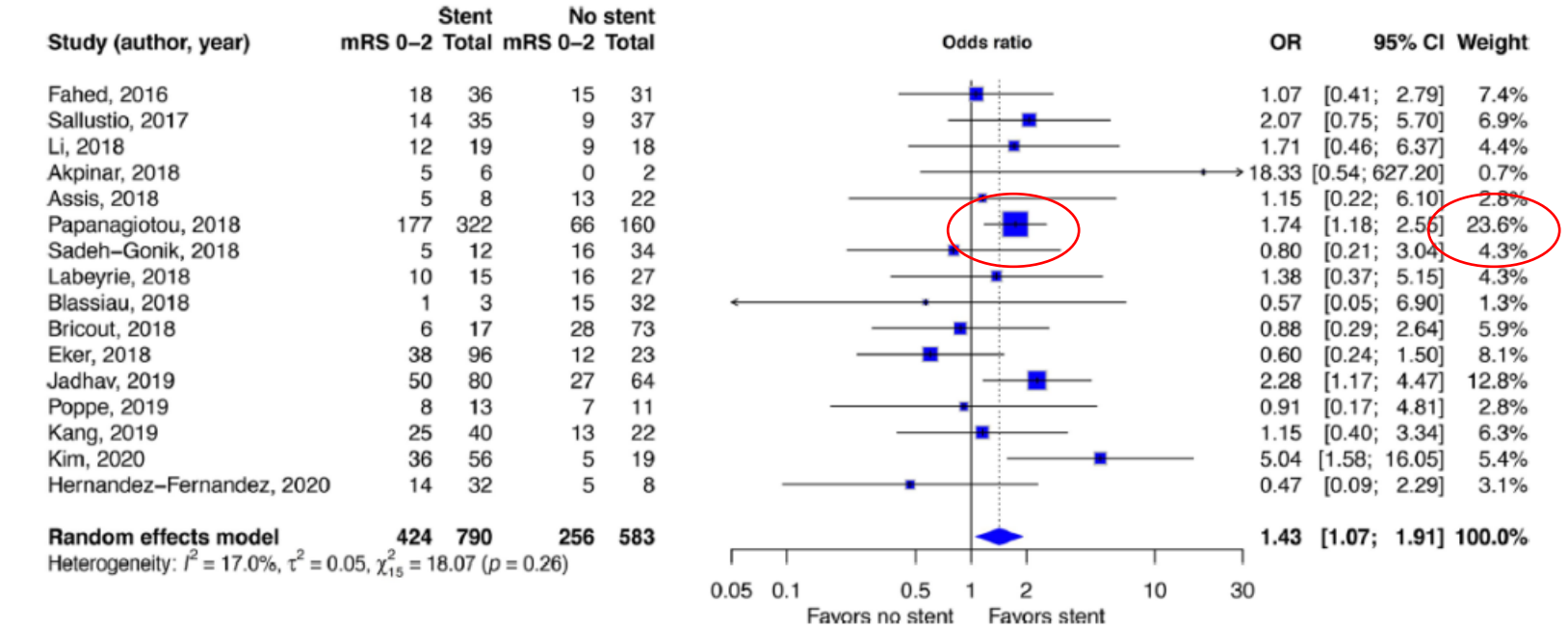
432 patients à inclure



# Stenting carotidien ?

## Acute carotid stenting in patients undergoing thrombectomy: a systematic review and meta-analysis

Gabrielle Dufort,[1,2] Bing Yu Chen,[3] Grégory Jacquin ,[1,2,4] Mark Keezer,[1,2,4] Marilyn Labrie,[1] Bastien Rioux,[1,2] Christian Stapf,[1,2,4] Daniela Ziegler,[5] Alexandre Y Poppe [1,2,4]



| Study (author, year) | Stent mRS 0–2 | Stent Total | No stent mRS 0–2 | No stent Total | OR | 95% CI | Weight |
|---|---|---|---|---|---|---|---|
| Fahed, 2016 | 18 | 36 | 15 | 31 | 1.07 | [0.41; 2.79] | 7.4% |
| Sallustio, 2017 | 14 | 35 | 9 | 37 | 2.07 | [0.75; 5.70] | 6.9% |
| Li, 2018 | 12 | 19 | 9 | 18 | 1.71 | [0.46; 6.37] | 4.4% |
| Akpinar, 2018 | 5 | 6 | 0 | 2 | 18.33 | [0.54; 627.20] | 0.7% |
| Assis, 2018 | 5 | 8 | 13 | 22 | 1.15 | [0.22; 6.10] | 2.8% |
| Papanagiotou, 2018 | 177 | 322 | 66 | 160 | 1.74 | [1.18; 2.56] | 23.6% |
| Sadeh–Gonik, 2018 | 5 | 12 | 16 | 34 | 0.80 | [0.21; 3.04] | 4.3% |
| Labeyrie, 2018 | 10 | 15 | 16 | 27 | 1.38 | [0.37; 5.15] | 4.3% |
| Blassiau, 2018 | 1 | 3 | 15 | 32 | 0.57 | [0.05; 6.90] | 1.3% |
| Bricout, 2018 | 6 | 17 | 28 | 73 | 0.88 | [0.29; 2.64] | 5.9% |
| Eker, 2018 | 38 | 96 | 12 | 23 | 0.60 | [0.24; 1.50] | 8.1% |
| Jadhav, 2019 | 50 | 80 | 27 | 64 | 2.28 | [1.17; 4.47] | 12.8% |
| Poppe, 2019 | 8 | 13 | 7 | 11 | 0.91 | [0.17; 4.81] | 2.8% |
| Kang, 2019 | 25 | 40 | 13 | 22 | 1.15 | [0.40; 3.34] | 6.3% |
| Kim, 2020 | 36 | 56 | 5 | 19 | 5.04 | [1.58; 16.05] | 5.4% |
| Hernandez–Fernandez, 2020 | 14 | 32 | 5 | 8 | 0.47 | [0.09; 2.29] | 3.1% |
| **Random effects model** | **424** | **790** | **256** | **583** | **1.43** | **[1.07; 1.91]** | **100.0%** |

Heterogeneity: $I^2 = 17.0\%$, $\tau^2 = 0.05$, $\chi^2_{15} = 18.07$ ($p = 0.26$)



**Figure 2** Meta-analysis of functional independence at 90 days (modified Rankin Scale (mRS) score of 0–2) with respect to acute stenting versus no stenting.

*JNIS 2020 %sICH similaire entre les deux populations*

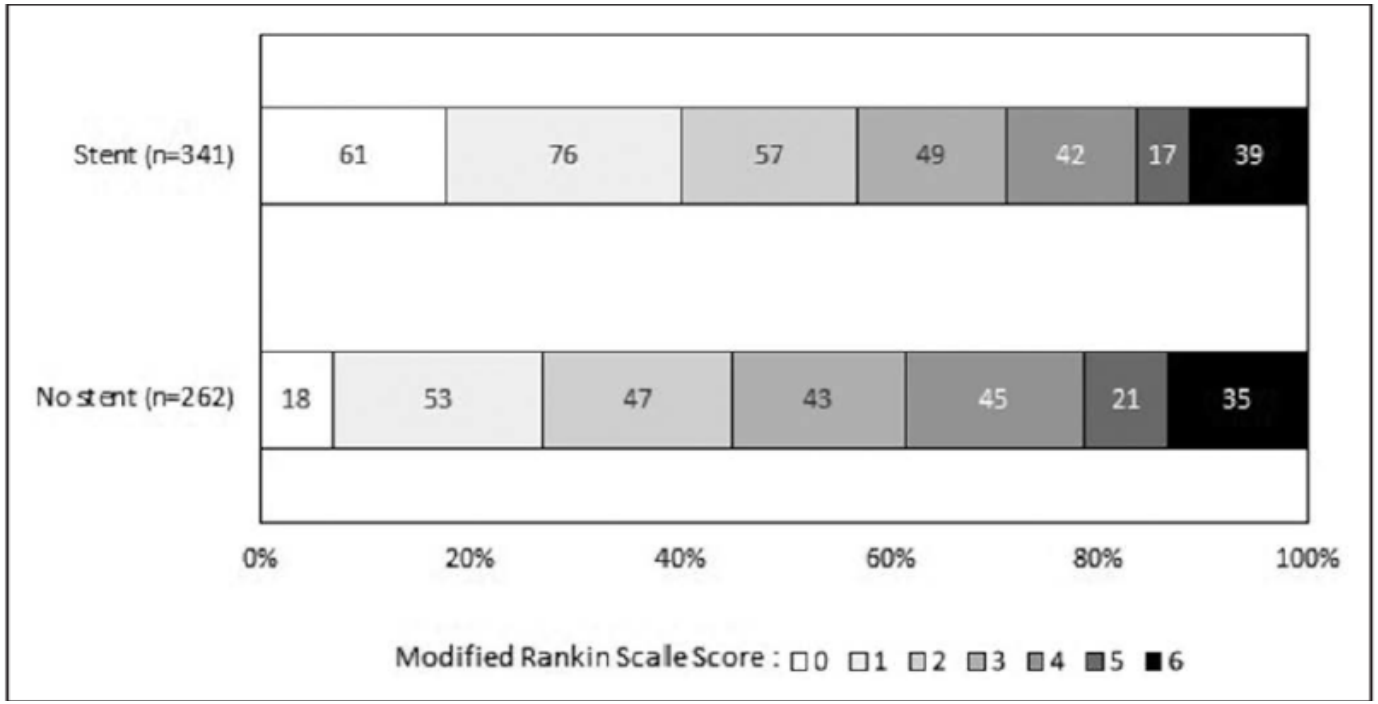
# Stenting carotidien ?

## Endovascular Therapy of Anterior Circulation Tandem Occlusions

### Pooled Analysis From the TITAN and ETIS Registries

Mohammad Anadani, MD; Gaultier Marnat, MD; Arturo Consoli, MD, MSc; Panagiotis Papanagiotou, MD, PhD; Raul G. Nogueira, MD; Adnan Siddiqui, MD; Marc Ribo, MD, PhD; Alejandro M. Spiotta, MD; Romain Bourcier, MD, PhD; Maeva Kyheng, BST; Julien Labreuche, BST; Adam de Havenon, MD; Igor Sibon, MD, PhD; Cyril Dargazanli, MD, MSc; Caroline Arquizan, MD; Christophe Cognard, MD, PhD; Jean-Marc Olivot, MD, PhD; René Anxionnat, MD, PhD; Gérard Audibert, MD, PhD; Mikaël Mazighi, MD, PhD; Raphaël Blanc, MD, MSc; Bertrand Lapergue, MD, PhD; Sébastien Richard, MD, PhD; Benjamin Gory, MD, PhD; for the TITAN and ETIS Registry Investigators*

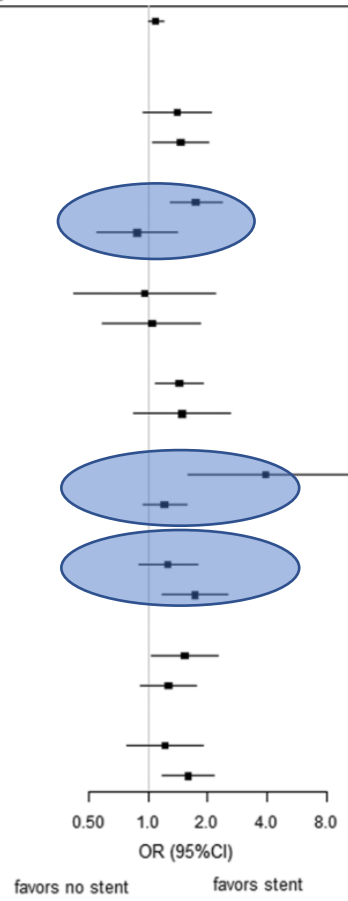
603 pts
341 CAS
Stenting bénéfique au plan :
- Clinique 57vs. 45%
- Angiographique




*Titan + Etis Stroke 2021*

# Stenting carotidien ?

| | No stent (n=262) | Stent (n=341) | IPTW adjusted* OR (95%CI) | p-value | p-het |
|---|---|---|---|---|---|
| Overall | 118/262 (45.0) | 194/341 (57.0) | 1.09 (1.01 to 1.19) | 0.036 | |
| Subgroups | | | | | |
| IVT | | | | | |
| No | 37/96 (38.5) | 63/127 (49.6) | 1.40 (0.95 to 2.07) | 0.091 | 0.88 |
| Yes | 81/166 (48.8) | 131/214 (61.2) | 1.46 (1.05 to 2.03) | 0.027 | |
| Etiology | | | | | |
| Atherosclerosis | 68/175 (38.9) | 151/264 (57.2) | 1.74 (1.30 to 2.35) | <0.001 | 0.013 |
| Dissection | 50/87 (57.5) | 43/77 (55.8) | 0.88 (0.55 to 1.40) | 0.59 | |
| Procedural antiplatelet | | | | | |
| No | 100/223 (44.8) | 15/34 (44.1) | 0.96 (0.42 to 2.20) | 0.92 | 0.87 |
| Yes | 18/39 (46.2) | 179/307 (58.3) | 1.05 (0.59 to 1.85) | 0.87 | |
| Age | | | | | |
| <75 | 104/211 (49.2) | 164/267 (61.4) | 1.44 (1.09 to 1.91) | 0.010 | 0.94 |
| ≥75 | 14/51 (27.4) | 30/74 (41.1) | 1.48 (0.84 to 2.62) | 0.18 | |
| NIHSS score | | | | | |
| <10 | 20/32 (61.1) | 57/65 (87.0) | 3.93 (1.49 to 10.34) | 0.006 | 0.018 |
| ≥10 | 98/230 (42.8) | 137/276 (49.9) | 1.21 (0.94 to 1.57) | 0.14 | |
| ASPECTS score | | | | | |
| <8 | 65/164 (39.7) | 70/153 (46.1) | 1.26 (0.90 to 1.77) | 0.18 | 0.21 |
| 8-10 | 53/98 (54.0) | 124/188 (65.8) | 1.72 (1.18 to 2.51) | 0.005 | |
| Onset to puncture time | | | | | |
| <180 | 42/82 (51.1) | 105/168 (62.6) | 1.53 (1.04 to 2.26) | 0.031 | 0.45 |
| ≥180 | 76/180 (42.2) | 89/173 (51.5) | 1.27 (0.91 to 1.75) | 0.16 | |
| Study | | | | | |
| ETIS | 62/133 (46.6) | 43/78 (55.1) | 1.22 (0.78 to 1.89) | 0.38 | 0.31 |
| TITAN | 56/129 (43.4) | 151/263 (57.4) | 1.59 (1.18 to 2.14) | 0.002 | |




Pas de bénéfice du stent si :

- Dissection
- ASPECT <8
- NIHSS > 10

*Titan + Etis Stroke 2021*

Endovascular Therapy of Anterior Circulation Tandem Occlusions

Pooled Analysis From the TITAN and ETIS Registries

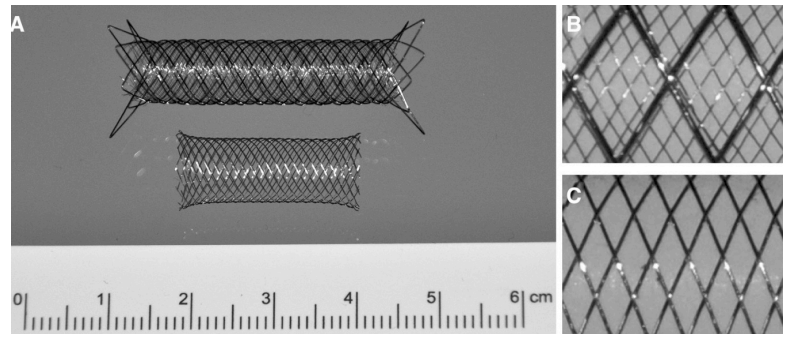
Mohammad Anadani, MD; Gaultier Marnat, MD; Arturo Consoli, MD, MSc; Panagiotis Papanagiotou, MD, PhD; Raul G. Nogueira, MD; Adnan Siddiqui, MD; Marc Ribo, MD, PhD; Alejandro M. Spiotta, MD; Romain Bourcier, MD, PhD; Maeva Kyheng, BST; Julien Labreuche, BST; Adam de Havenon, MD; Igor Sibon, MD, PhD; Cyril Dargazanli, MD, MSc; Caroline Arquizan, MD; Christophe Cognard, MD, PhD; Jean-Marc Olivot, MD, PhD; René Anxionnat, MD, PhD; Gérard Audibert, MD, PhD; Mikaël Mazighi, MD, PhD; Raphaël Blanc, MD, MSc; Bertrand Lapergue, MD, PhD; Sébastien Richard, MD, PhD; Benjamin Gory, MD, PhD; for the TITAN and ETIS Registry Investigators*

# Stenting carotidien ?

## Quel Stent ?

Occlusions immédiates et retardées
20% à 55%

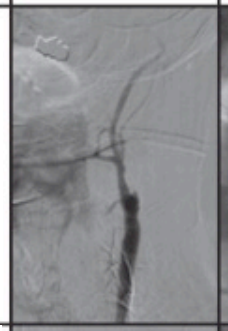
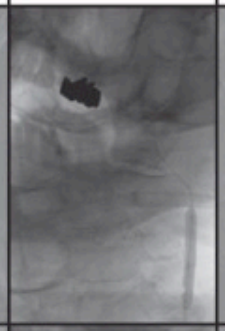
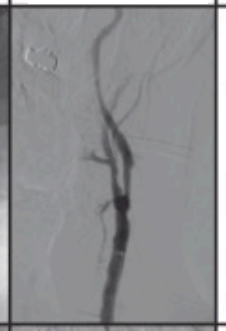
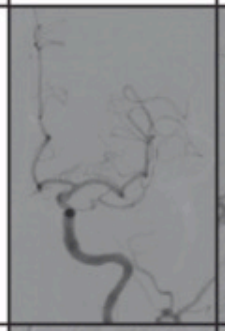
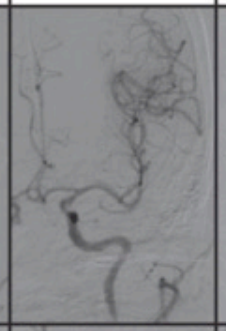
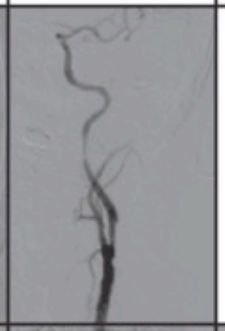
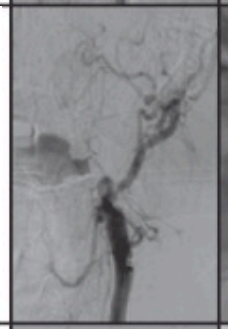
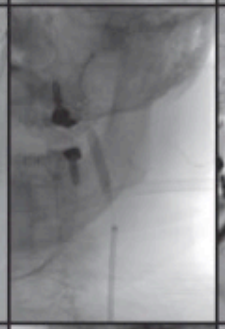
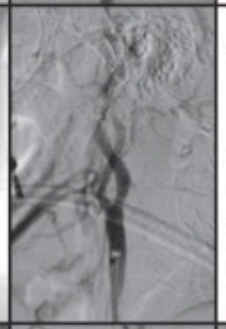
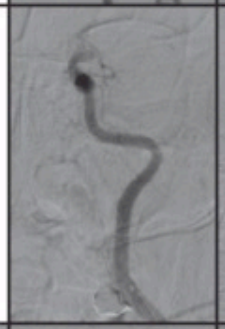
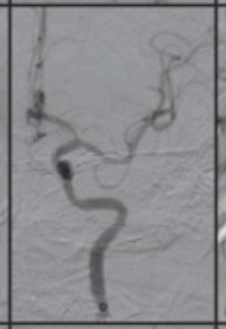
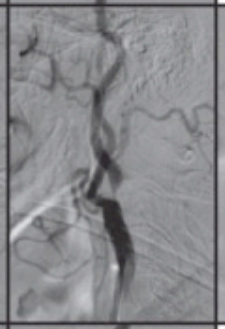
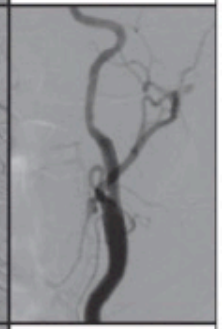
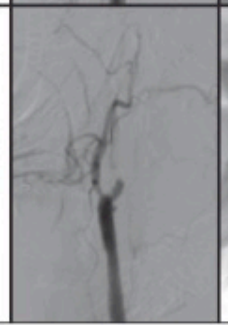
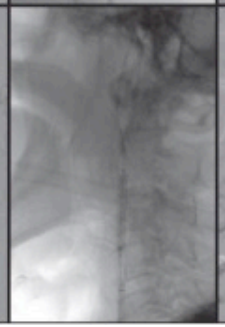
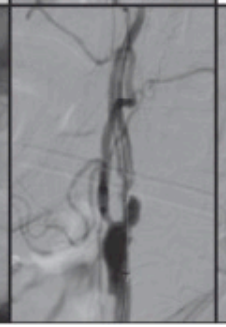
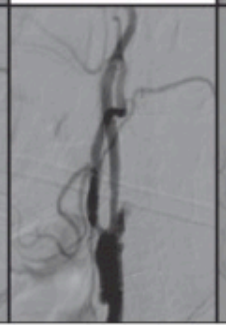
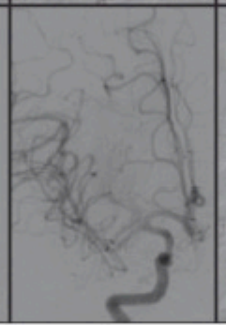
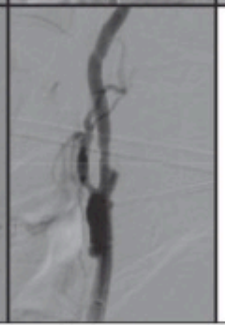
Simple ou double couche ?
+ Meilleure couverture de la plaque
reduction de sa “fragmentation”
- Densité métallique = thrombogénicité




*Yilmaz U et al. Stroke 2017*
*Bartolini et al. JNIS 2019*
*Pop R et al. AJNR 2019*
*Bricout N et al Stroke 2018*

Ecole de la Thrombectomie

# Head first or Neck first ?

| | Initial | Angio Plastie | Post Angio Plastie | Stent | Thrombectomie | Post TM | Final + 20min | Stent second |
|---|---|---|---|---|---|---|---|---|
| Aspi e/o Angio plastie **puis** IC |  |  |  | X |  |  |  | X |
| Angio plastie - IC - stent |  |  |  | X |  |  |  |  |
| Angio plastie - stent - IC |  |  |  |  |  |  |  | X |

# Head first or Neck first ?

088 dans l'ACC

↓

Guide de 14 et microKT
au-delà du clot IC

↓

Déploiement du SR
autour du clot
Retrait du microKT

↓

Monorail Ballon sur guide du SR

↓

Angioplastie

↓

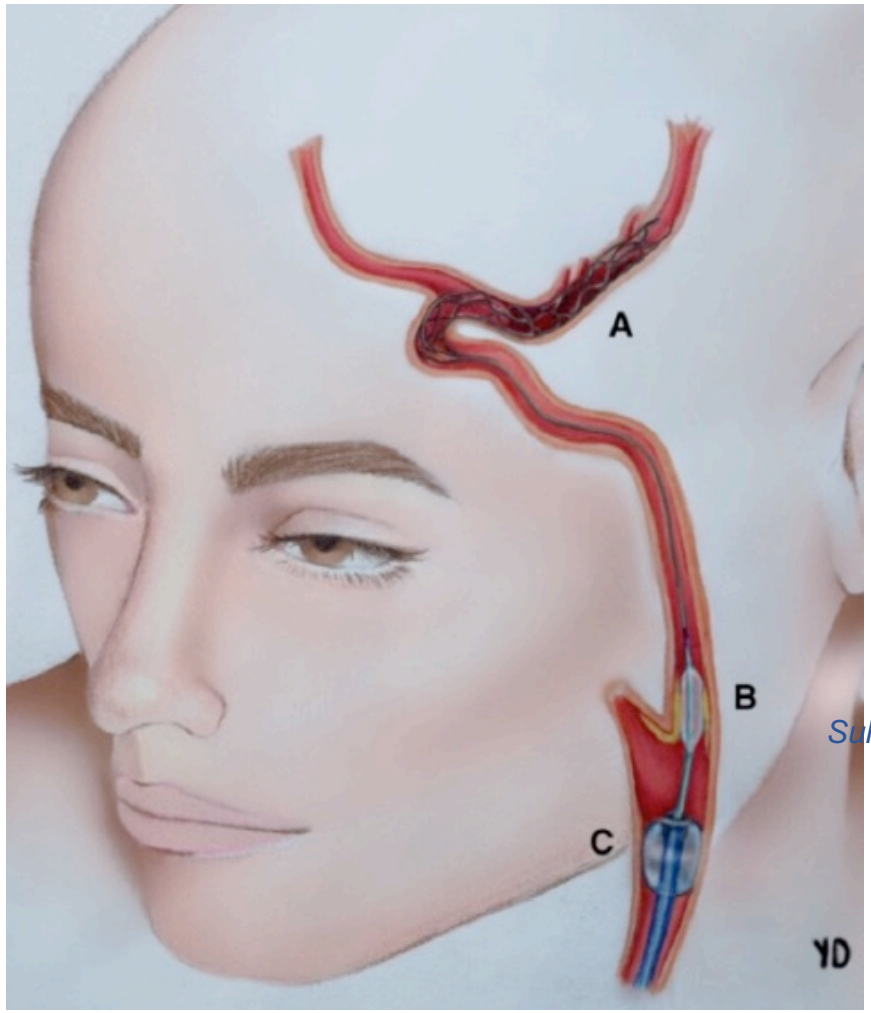
Déflation et avancée du
BGC / 088 sur le ballon

↓

Thrombec

## Les 2 (cervical et IC) en même temps ?

« The Single Cross Technique »

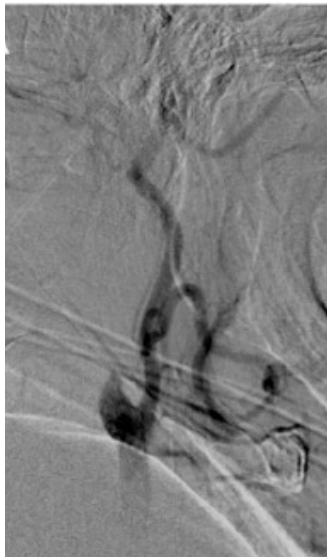


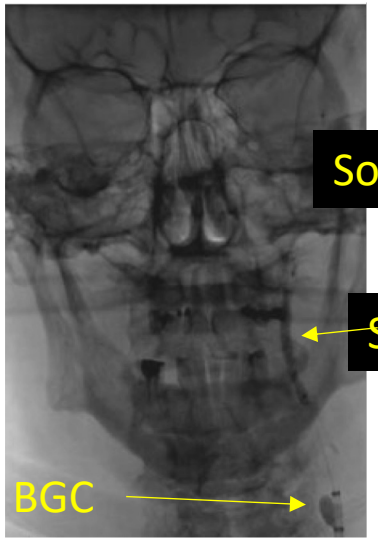

*Sultan-Qurraie et al. JNIS 2019*

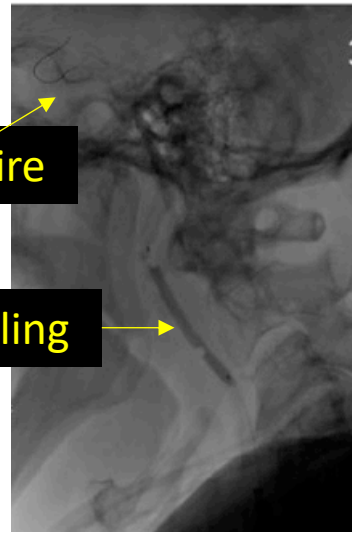
# Head first or Neck first ?

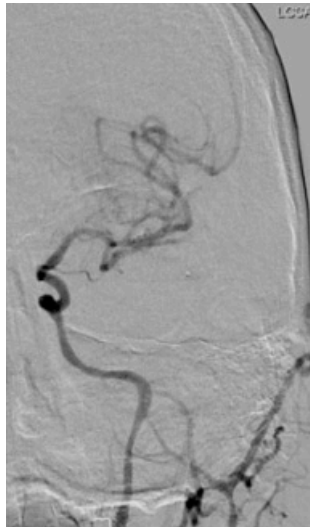
## Les 2 (cervical et IC) en même temps ?

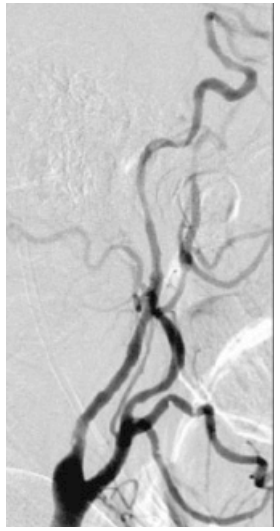
## « The Single Cross Technique »









*Original Article*

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**Simultaneous revascularization of the occluded internal carotid artery using the Solitaire as a workhorse wire during acute ischemic stroke intervention**

Alexandra R Paul, Pouya Entezami, Emad Nourollahzadeh, John Dalfino and Alan S Boulos

*Technical Note*

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**Technical note on endovascular treatment of concomitant carotid occlusion in large vessel occlusion stroke: The "single-cross" technique**

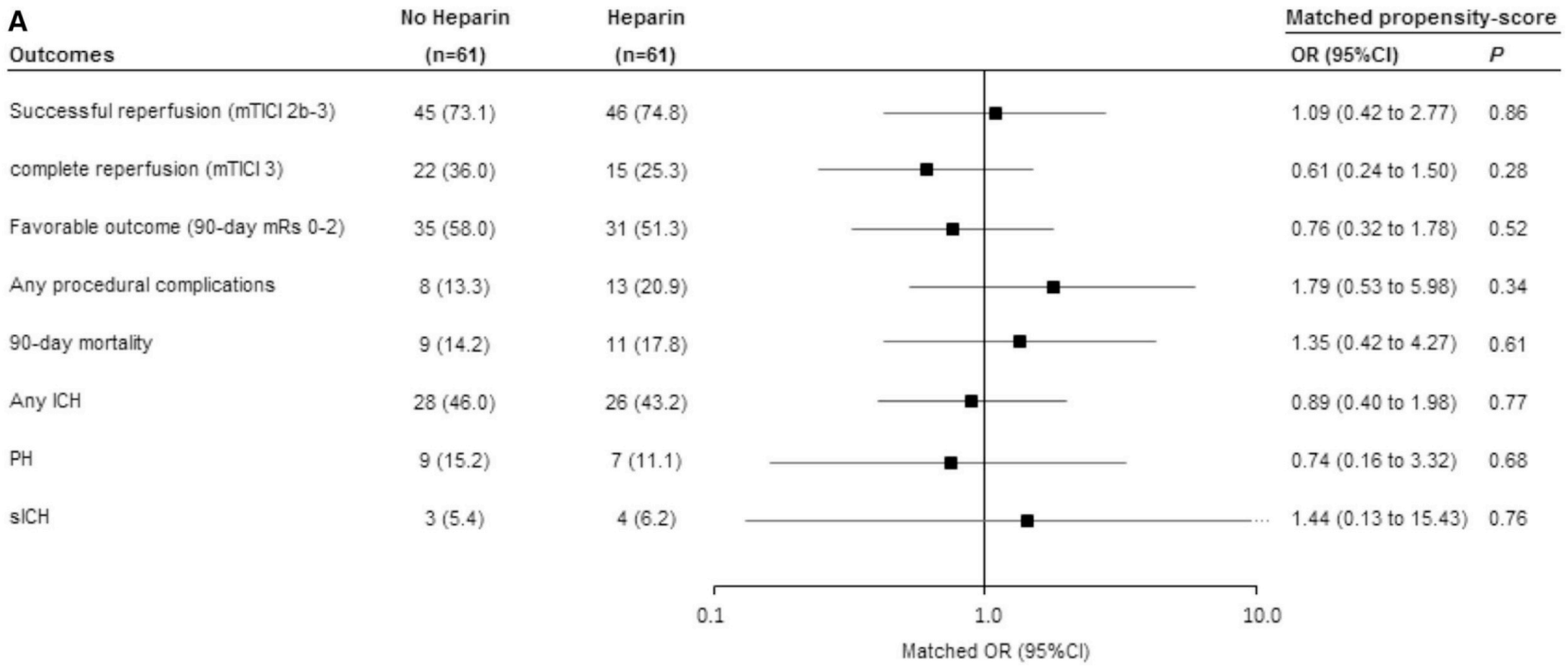
Christian N Ramsey, Charles B Newman, Michael R Jones, Anona Archer and Curtis A Given

SEIMLESS: Simultaneous Extracranial, Intracranial Management of (tandem) LESsions in Stroke

Ali Sultan-Qurraie,[1] Taylor Witt,[2] Adam de Havenon,[3] Marc Ribo,[4] Osama O Zaidat[5]

# Fluidifiants sanguins pendant le geste ?

## Héparine




Pas d'aumentation du risque

Pas de bénéfice angiographique ou clinique

*F Zhu et al. CVIR 2019, population matchée, Héparine 68/369, stenting et au moins un AAP : 70%*

# Fluidifiants sanguins pendant le geste ?

## Héparine

**Table 2** Multivariate logistic regressions for clinical and hemorrhagic outcomes

| | Tirofiban (n=51) | DAT (n=111) | Heparin (n=71) | Tirofiban & heparin (n=10) | DAT & heparin (n=61) | Tirofiban "rescue" (n=8) |
|---|---|---|---|---|---|---|
| Any ICH; OR (95% CI), *P-value** | 1.16 (0.51 to 2.66) | 0.9 (0.40 to 2.04) | 2.46 (1.15 to 5.28)* | 2.88 (0.61 to 13.58) | 2.42 (1.13 to 5.18)* | 1.30 (0.24 to 7.02) |
| sICH; OR (95% CI), *P-value** | 0.85 (0.18 to 4.08) | 1.27 (0.27 to 5.89) | 3.71 (1.18 to 14.95)* | 1.24 (0.09 to 16.82) | 4.14 (1.03 to 16.58)* | n.a. |
| Moderate outcome; OR (95% CI), *P-value†* | 0.64 (0.27 to 1.50) | 0.70 (0.30 to 1.63) | 0.33 (0.15 to 0.72)* | 0.51 (0.09 to 2.80) | 0.37 (0.16 to 0.86)* | 0.83 (0.17 to 3.97) |
| Mortality; OR (95% CI), *P-value†* | 0.31 (0.09 to 1.02) | 1.31 (0.47 to 3.63) | 2.84 (1.10 to 7.31)* | 1.15 (0.11 to 12.53) | 3.06 (1.10 to 8.54)* | n.a. |

*Model 1 adjusted for age, sex, baseline NIHSS scores, ASPECTS on baseline NCCT, concomitant intravenous lysis therapy, successful recanalization (TICI ≥2b), diabetes mellitus, arterial hypertension, coronary heart disease, hypercholesterinemia, premedication with ASA, premedication with clopidogrel, premedication with marcoumar, premedication with new oral anticoagulants.
†Model 2 adjusted for age, sex, baseline NIHSS scores, ASPECTS on baseline NCCT, concomitant intravenous lysis therapy, onset-to-groin in minutes, successful recanalization (TICI ≥2b).
ICH, intracranial hemorrhage; sICH, symptomatic intracranial hemorrhage; DAT, dual antiplatelet therapy; OR, odds ratio.

Aumentation du risque pour HNF seule et HNF + DAT

*Neuberger et al. JNS 2019*

# Fluidifiants sanguins pendant le geste ?

## Héparine

**Carotid Stenting and Mechanical Thrombectomy in Patients with Acute Ischemic Stroke and Tandem Occlusions: Antithrombotic Treatment and Functional Outcome**

V. Da Ros, J. Scaggiante, F. Sallustio, S. Lattanzi, M. Bandettini, A. Sgreccia, C. Rolla-Bigliani, E. Lafe, G. Sanfilippo, M. Diomedi, M. Ruggiero, N. Haznedari, M. Giannoni, C. Finocchi, and R. Floris

**Table 2: Multivariate analysis of factors influencing symptomatic ICH and functional independence**

| Factors | Mean | 95% CI | *P* Value |
|---|---|---|---|
| Influencing symptomatic ICH | | | |
| Intraprocedural heparin ≥3000 IU | 3547 ± 588 IU | 2377–4718 | .01 |
| ASPECTS ≤7 | 6.6 ± 0.4 | 5.8–7.4 | .001 |
| MT attempts ≥3 | 3.3 ± 0.3 | 2.6–4.1 | .002 |
| Influencing functional independence (mRS ≤2) | | | |
| ASPECTS ≥8 | 8.4 ± 0.4 | 7.9–9.2 | .001 |
| MT attempts ≤2 | 1.9 ± 0.3 | 1.3–2.5 | .004 |

Aumentation du risque constaté > 3000 UI

*Da Ros et al. AJNR 2020, population stentée n=95*

# Fluidifiants sanguins pendant le geste ?

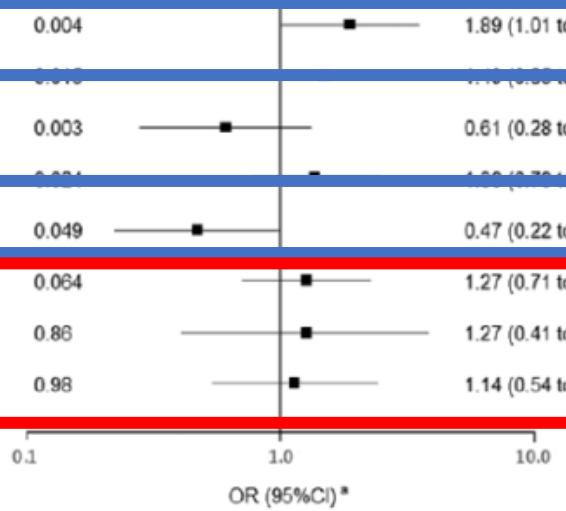
## Antiagrégants

**Impact of Antiplatelet Therapy During Endovascular Therapy for Tandem Occlusions**
**A Collaborative Pooled Analysis**

François Zhu, MD, MSc; Mohammad Anadani, MD; Julien Labreuche, BST; Alejandro Spiotta, MD; Francis Turjman, MD, PhD; Michel Piotin, MD, PhD; Henrik Steglich-Arnholm, MD; Markus Holtmannspötter, MD; Christian Taschner, MD, PhD; Sebastian Eiden, MD; Diogo C. Haussen, MD; Raul G. Nogueira, MD; Panagiotis Papanagiotou, MD, PhD; Maria Boutchakova, MD; Adnan H. Siddiqui, MD, PhD; Bertrand Lapergue, MD, PhD; Franziska Dorn, MD; Christophe Cognard, MD, PhD; Monika Killer-Oberpfalzer, MD; Salvatore Mangiafico, MD; Marc Ribo, MD, PhD; Marios N. Psychogios, MD, PhD; Marc-Antoine Labeyrie, MD; Mikael Mazighi, MD, PhD; Alessandra Biondi, MD, PhD; René Anxionnat, MD, PhD; Serge Bracard, MD; Sébastien Richard, MD, PhD; Benjamin Gory, MD, PhD; and the TITAN Investigators*

*2012 2016*

| | Antiplatelet Agents | | | | | |
|---|---|---|---|---|---|---|
| | None (n=145) | ≥1 agents (n=224) | OR (95%CI) | P | OR (95%CI)* | P* |
| Successful reperfusion (mTICI 2b/3) | 103/145 (71.0) | 188/224 (83.9) | 2.13 (1.28 to 3.54) | 0.004 | 1.89 (1.01 to 3.54) | 0.045 |
| Procedural complication | 30/141 (21.3) | 21/216 (9.7) | 0.40 (0.21 to 0.74) | 0.003 | 0.61 (0.28 to 1.32) | 0.21 |
| 90-day all-cause mortality (mRS, 6) | 26/139 (18.7) | 25/223 (11.2) | 0.55 (0.30 to 1.00) | 0.049 | 0.47 (0.22 to 0.98) | 0.042 |
| Any ICH | 56/144 (38.9) | 98/200 (49.0) | 1.51 (0.97 to 2.34) | 0.064 | 1.27 (0.71 to 2.27) | 0.41 |
| Symptomatic ICH | 8/144 (5.6) | 12/200 (6.0) | 1.08 (0.43 to 2.74) | 0.86 | 1.27 (0.41 to 3.85) | 0.68 |
| Parenchymal hematoma | 21/144 (14.6) | 29/200 (14.5) | 0.99 (0.54 to 1.83) | 0.98 | 1.14 (0.54 to 2.41) | 0.72 |




*Zhu et al. Stroke 2020, toutes les occlusions en tandem – pas d'impact de l'héparine, de la fibrinolyse*

# Fluidifiants sanguins pendant le geste ?

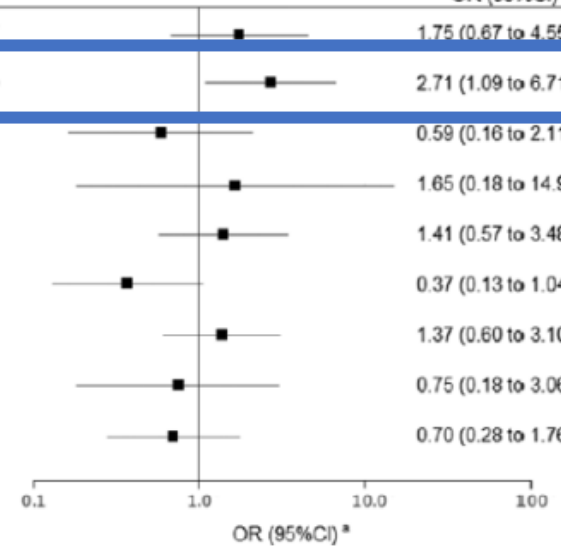
## Antiagrégants

**Impact of Antiplatelet Therapy During Endovascular Therapy for Tandem Occlusions**
**A Collaborative Pooled Analysis**

François Zhu, MD, MSc; Mohammad Anadani, MD; Julien Labreuche, BST; Alejandro Spiotta, MD; Francis Turjman, MD, PhD; Michel Piotin, MD, PhD; Henrik Steglich-Arnholm, MD; Markus Holtmannspötter, MD; Christian Taschner, MD, PhD; Sebastian Eiden, MD; Diogo C. Haussen, MD; Raul G. Nogueira, MD; Panagiotis Papanagiotou, MD, PhD; Maria Boutchakova, MD; Adnan H. Siddiqui, MD, PhD; Bertrand Lapergue, MD, PhD; Franziska Dorn, MD; Christophe Cognard, MD, PhD; Monika Killer-Oberpfalzer, MD; Salvatore Mangiafico, MD; Marc Ribo, MD, PhD; Marios N. Psychogios, MD, PhD; Marc-Antoine Labeyrie, MD; Mikael Mazighi, MD, PhD; Alessandra Biondi, MD, PhD; René Anxionnat, MD, PhD; Serge Bracard, MD; Sébastien Richard, MD, PhD; Benjamin Gory, MD, PhD; and the TITAN Investigators*

*2012 2016*

| | Antiplatelet Agents | | | | | |
|---|---|---|---|---|---|---|
| | None (n=41) | ≥1 agents (n=188) | OR (95%CI) | P | OR (95%CI) [a] | P [a] |
| Successful reperfusion (mTICI 2b/3) | 30/41 (73.2) | 159/188 (84.6) | 2.01 (0.90 to 4.48) | 0.087 | 1.75 (0.67 to 4.55) | 0.25 |
| Complete reperfusion (mTICI 3) | 8/41 (19.5) | 79/188 (42.0) | 2.99 (1.30 to 6.86) | 0.010 | 2.71 (1.09 to 6.71) | 0.031 |
| Procedural complication | 8/40 (20.0) | 19/180 (10.6) | 0.47 (0.18 to 1.18) | 0.11 | 0.59 (0.16 to 2.11) | 0.42 |
| In-stent thrombosis[b] | 1/28 (3.6) | 22/144 (15.3) | 4.87 (0.62 to 38.26) | 0.13 | 1.65 (0.18 to 14.91) | 0.65 |
| 90-day favorable outcome (mRS, 0-2) | 20/40 (50.0) | 113/187 (60.4) | 1.53 (0.76 to 3.05) | 0.23 | 1.41 (0.57 to 3.48) | 0.46 |
| 90-day all-cause mortality (mRS, 6) | 8/40 (20.0) | 20/187 (10.7) | 0.48 (0.19 to 1.19) | 0.11 | 0.37 (0.13 to 1.04) | 0.059 |
| Any ICH | 16/41 (39.0) | 81/164 (49.4) | 1.53 (0.75 to 3.08) | 0.24 | 1.37 (0.60 to 3.10) | 0.46 |
| Symptomatic ICH | 4/41 (9.8) | 12/164 (7.3) | 0.73 (0.22 to 2.42) | 0.60 | 0.75 (0.18 to 3.06) | 0.69 |
| Parenchymal hematoma | 9/41 (22.0) | 27/164 (16.5) | 0.70 (0.29 to 1.65) | 0.41 | 0.70 (0.28 to 1.76) | 0.45 |




*Zhu et al. Stroke 2020, population stentée*

# Fluidifiants sanguins pendant le geste ?

| | Antiplatelet agents | | | | |
|---|---|---|---|---|---|
| | None (n=145) | Single (n=128) | ≥2 agents (n=96) | *P Value* | OR (95%CI)[a] |
| **Any ICH** | | | | | |
| n (%) | 56/144 (38.9) | 50/104 (48.1) | 48/96 (50.0) | | |
| Unadjusted OR (95%CI) | 1.00 (reference) | 1.46 (0.87 to 2.43) | 1.57 (0.93 to 2.66) | 0.17 | 1.21 (0.98 to 1.51) |
| Adjusted OR (95%CI)[b] | 1.00 (reference) | 1.22 (0.64 to 2.32) | 1.30 (0.63 to 2.67) | 0.91 | 1.06 (0.77 to 1.46) |
| **Symptomatic ICH** | | | | | |
| n (%) | 8/144 (5.6) | 5/104 (4.8) | 7/96 (7.3) | | |
| Unadjusted OR (95%CI) | 1.00 (reference) | 0.86 (0.27 to 2.72) | 1.34 (0.46 to 3.83) | | |
| Adjusted OR (95%CI)[b] | 1.00 (reference) | 1.08 (0.30 to 3.87) | 1.64 (0.40 to 6.58) | | |
| **Parenchymal hematoma** | | | | | |
| n (%) | 21/144 (14.6) | 17/104 (16.4) | 12/96 (12.5) | | |
| Unadjusted OR (95%CI) | 1.00 (reference) | 1.14 (0.56 to 2.30) | 0.84 (0.39 to 1.80) | 0.74 | 0.98 (0.72 to 1.33) |

**…f Antiplatelet Therapy During Endovascular Therapy for Tandem Occlusions**
**A Collaborative Pooled Analysis**

2012 2016

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## Discussion

In this large multicenter study, administration of antiplatelet therapy during EVT for anterior circulation tandem occlusions was associated with better angiographic results and lower mortality risk, without increasing the risk of procedural or hemorrhagic complications. When patients were divided according to the number of antiplatelets, we did not observe differences in angiographic, hemorrhagic, and functional outcomes between the 3 groups (none versus 1 versus ≥2 agents).

# Fluidifiants sanguins après le geste ?

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Clinical study

## Safety and efficacy of early antiplatelet therapy in acute ischemic stroke patients receiving endovascular treatment: A systematic review and meta-analysis

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A B S T R A C T

*Background:* Endovascular treatment (ET) has been proved as safety and effective in acute ischemic stroke. However, early reocclusion is an inevitable complication following ET. There is uncertainty effect of early antiplatelet therapy on outcomes in patients with acute ischemic stroke undergoing endovascular treatment.

*Methods:* We searched major databases for articles published from 2011 to 2019 in the present study. Safety outcomes were any intracranial hemorrhage (ICH), symptomatic intracranial hemorrhage (sICH) and mortality. Efficacy outcomes were recanalization rate and follow-up functional outcome. Review Manager 5.3 and Stata Software Package 14.0 were used to perform the meta-analysis.

*Results:* Seven studies with a total of 1251 patients were included. A total of 451 (36.1%) patients were administrated by antiplatelet agent following ET. Meta-analysis suggested that early antiplatelet did not increase the risk for ICH (OR 1.15; 95% CI 0.56–2.37; P = 0.70), sICH (OR 1.29; 95% CI 0.79–2.09; P = 0.31) and mortality (OR 0.71; 95% CI 0.45–1.12; P = 0.14). There was no association between antiplatelet therapy and recanalization rate (OR 1.03; 95% CI 0.73–1.46; P = 0.30) or functional outcome (OR 0.97; 95% CI 0.55–1.69; P = 0.90). Sensitivity analysis indicated tirofiban did not associated with any ICH and mortality, nor improve the recanalization rate and functional outcome in patients receiving ET or mechanical thrombectomy (all p > 0.05).

*Conclusions:* Early antiplatelet therapy may be safe in acute ischemic stroke patients, further studies are needed to confirm the efficacy.





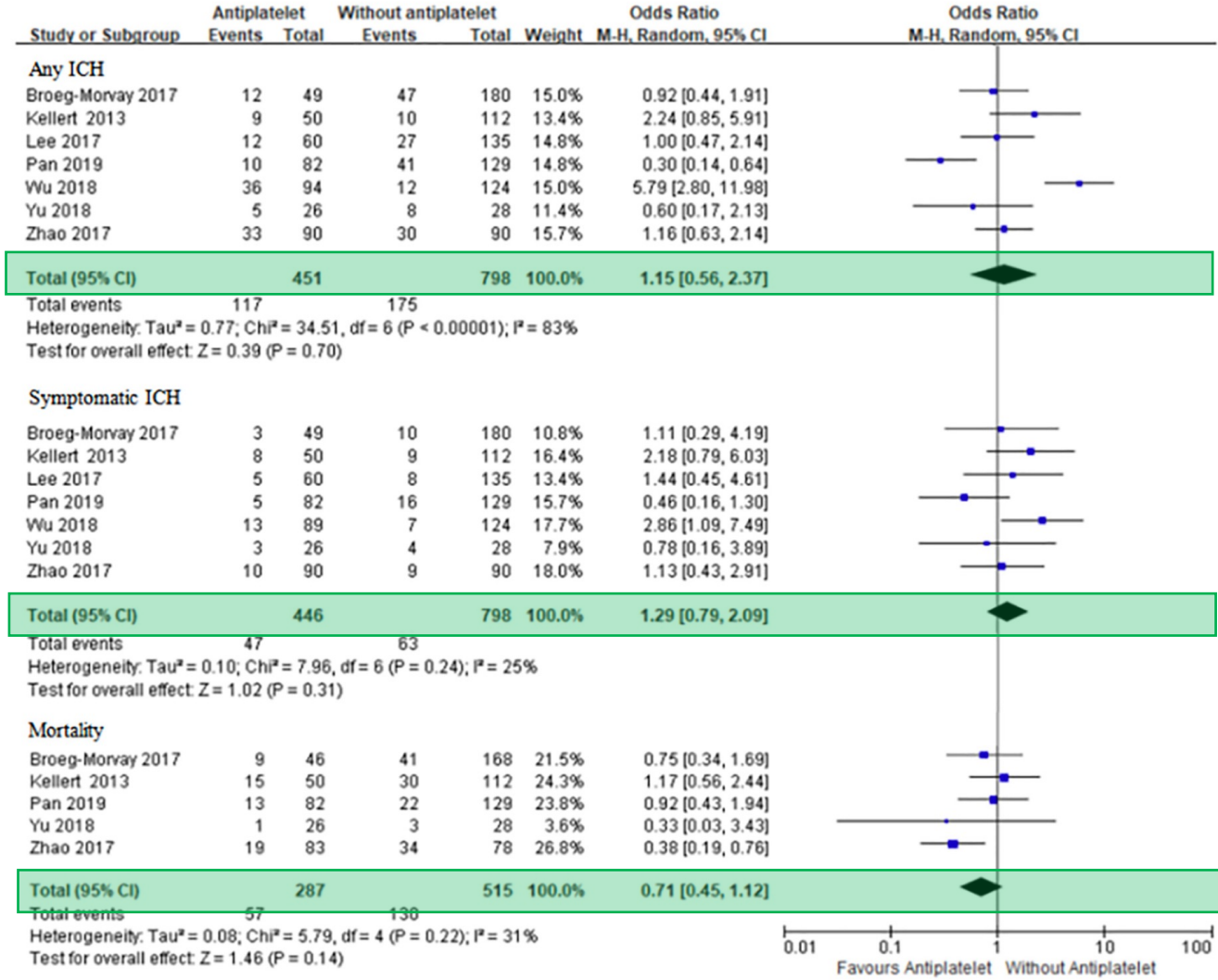


**Fig. 2.** Meta-analysis of safety outcomes in patients with and without antiplatelet agent.

# Fluidifiants sanguins après le geste ?

## 24-Hour Carotid Stent Patency and Outcomes After Endovascular Therapy: A Multicenter Study

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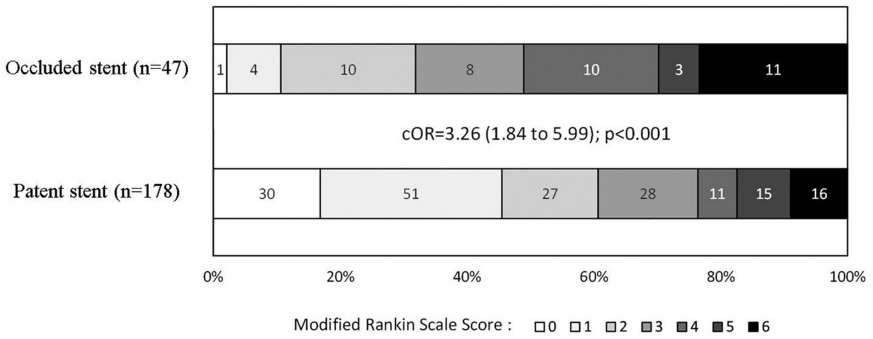


**Table 2. Univariate Association of Treatment Characteristics With 24 (±12)-Hour Stent Patency**

| Characteristics | Stent patency | | *P* value | OR (95% CI) |
|---|---|---|---|---|
| | No (n=47) | Yes (n=178) | | |
| Number of stents | | | | |
| 1 | 35/47 (74.5) | 155/178 (87.1) | 0.034 | 1.00 (ref.) |
| 2 | 12/47 (25.5) | 23/178 (12.9) | | 0.43 (0.19–0.96) |
| Stent types | | | | |
| Single layer | 36/47 (76.6) | 167/178 (93.8) | 0.001* | 1.00 (ref.) |
| Dual layer | 11/47 (23.4) | 11/178 (6.2) | | 0.22 (0.08–0.54)† |
| Balloon angioplasty | 24/47 (51.1) | 126/176 (71.6) | 0.008 | 2.42 (1.24–4.67) |
| Intravenous thrombolysis | 22/47 (46.8) | 85/178 (47.8) | 0.91 | 1.04 (0.54–1.98) |
| Antiplatelet during procedure | | | | |
| None | 5/47 (10.6) | 19/177 (10.7) | 0.091 | 1.00 (ref.) |
| Single | 35/47 (74.5) | 104/177 (58.8) | | 0.78 (0.27–2.25) |
| Dual | 7/47 (14.9) | 54/177 (30.5) | | 2.03 (0.57–7.17) |
| Type | | | | |
| Aspirin | 37/47 (78.7) | 150/177 (84.7) | 0.32 | 1.50 (0.66–3.28) |
| $P2Y_{12}$ antagonists | 5/47 (10.6) | 46/177 (26.0) | 0.026 | 2.95 (1.10–7.91) |
| gpIIb/IIIa antagonists | 4/47 (8.5) | 5/177 (2.8) | 0.095* | 0.31 (0.08–1.20)† |
| Heparin during procedure | 10/47 (21.3) | 35/177 (19.8) | 0.82 | 0.91 (0.41–2.01) |
| Stent thrombosis at the end of procedure | 8/47 (17.0) | 7/177 (4.0) | 0.004 | 0.20 (0.06–0.59) |

# Fluidifiants sanguins si sICH

## Antiplatelet Therapy After Spontaneous Intracerebral Hemorrhage and Functional Outcomes

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***Background and Purpose***—Observational data suggest that antiplatelet therapy after intracerebral hemorrhage (ICH) alleviates thromboembolic risk without increasing the risk of recurrent ICH. Given the paucity of data on the relationship between antiplatelet therapy after ICH and functional outcomes, we aimed to study this association in a multicenter cohort.

***Methods***—We meta-analyzed data from (1) the Massachusetts General Hospital ICH registry (n=1854), (2) the Virtual International Stroke Trials Archive database (n=762), and (3) the Yale stroke registry (n=185). Our exposure was antiplatelet therapy after ICH, which was modeled as a time-varying covariate. Our primary outcomes were all-cause mortality and a composite of major disability or death (modified Rankin Scale score 4–6). We used Cox proportional regression analyses to estimate the hazard ratio of death or poor functional outcome as a function of antiplatelet therapy and random-effects meta-analysis to pool the estimated HRs across studies. Additional analyses stratified by hematoma location (lobar and deep ICH) were performed.

***Results***—We included a total of 2801 ICH patients, of whom 288 (10.3%) were started on antiplatelet medications after ICH. Median times to antiplatelet therapy ranged from 7 to 39 days. Antiplatelet therapy after ICH was not associated with mortality (hazard ratio, 0.85; 95% CI, 0.66–1.09), or death or major disability (hazard ratio, 0.83; 95% CI, 0.59–1.16) compared with patients not started on antiplatelet therapy. Similar results were obtained in additional analyses stratified by hematoma location.

***Conclusions***—Antiplatelet therapy after ICH appeared safe and was not associated with all-cause mortality or functional outcome, regardless of hematoma location. Randomized clinical trials are needed to determine the effects and harms of antiplatelet therapy after ICH. **(*Stroke*. 2019;50:3057-3063. DOI: 10.1161/STROKEAHA.119.025972.)**

**Key Words:** cerebral hemorrhage ■ mortality ■ platelet aggregation inhibitors ■ stroke

# Fluidifiants sanguins si sICH

## Effects of antiplatelet therapy after stroke due to intracerebral haemorrhage (RESTART): a randomised, open-label trial

*RESTART Collaboration**


### Summary

**Background** Antiplatelet therapy reduces the risk of major vascular events for people with occlusive vascular d although it might increase the risk of intracranial haemorrhage. Patients surviving the commonest sub intracranial haemorrhage, intracerebral haemorrhage, are at risk of both haemorrhagic and occlusive vascular but whether antiplatelet therapy can be used safely is unclear. We aimed to estimate the relative and absolute of antiplatelet therapy on recurrent intracerebral haemorrhage and whether this risk might exceed any reduc occlusive vascular events.

**Methods** The REstart or STop Antithrombotics Randomised Trial (RESTART) was a prospective, randomised label, blinded endpoint, parallel-group trial at 122 hospitals in the UK. We recruited adults (≥18 years) wh taking antithrombotic (antiplatelet or anticoagulant) therapy for the prevention of occlusive vascular disease they developed intracerebral haemorrhage, discontinued antithrombotic therapy, and survived for 24 h. Compu randomisation incorporating minimisation allocated participants (1:1) to start or avoid antiplatelet thera followed participants for the primary outcome (recurrent symptomatic intracerebral haemorrhage) for up to 5 We analysed data from all randomised participants using Cox proportional hazards regression, adjust minimisation covariates. This trial is registered with ISRCTN (number ISRCTN71907627).

**Findings** Between May 22, 2013, and May 31, 2018, 537 participants were recruited a median of 76 days (IQR 29–146) after intracerebral haemorrhage onset: 268 were assigned to start and 269 (one withdrew) to avoid antiplatelet therapy. Participants were followed for a median of 2·0 years (IQR [1·0– 3·0]; completeness 99·3%). 12 (4%) of 268 participants allocated to antiplatelet therapy had recurrence of intracerebral haemorrhage compared with 23 (9%) of 268 participants allocated to avoid antiplatelet therapy (adjusted hazard ratio 0·51 [95% CI 0·25–1·03]; p=0·060). 18 (7%) participants allocated to antiplatelet therapy experienced major haemorrhagic events compared with 25 (9%) participants allocated to avoid antiplatelet therapy (0·71 [0·39–1·30]; p=0·27), and 39 [15%] participants allocated to antiplatelet therapy had major occlusive vascular events compared with 38 [14%] allocated to avoid antiplatelet therapy (1·02 [0·65–1·60]; p=0·92).

**Interpretation** These results exclude all but a very modest increase in the risk of recurrent intracerebral haemorrhage with antiplatelet therapy for patients on antithrombotic therapy for the prevention of occlusive vascular disease when they developed intracerebral haemorrhage. The risk of recurrent intracerebral haemorrhage is probably too small to exceed the established benefits of antiplatelet therapy for secondary prevention.



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### Antiplatelets after intracerebral haemorrhage: treat the patient, not the brain imaging

Hanne Christensen

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# Conclusion


- Procédures plus difficiles

- Réalité du tandem ?
- Distinguer athérome de dissection

- Anesthésie

- Différentes options, différentes stratégies
- Lésion cervicale à franchir
- « ordre » de traitement
- Stent – AAP

- Penser TITAN