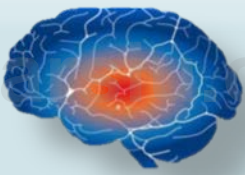




Quoi de neuf en neurovasculaire en 2018



Lamine ABDENNOUR
Unité de neuro-réanimation chirurgicale
Département d'anesthésie-Réanimation
CHU Pitié-Salpêtrière
lamine.abdennour@free.fr

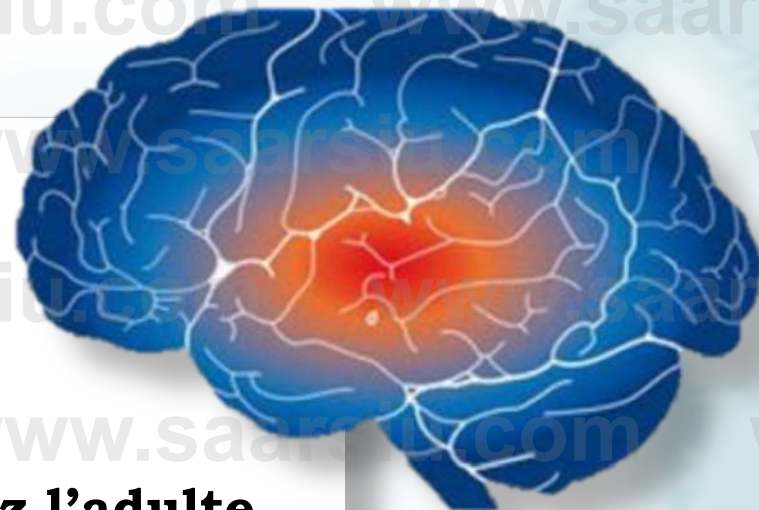


AVC

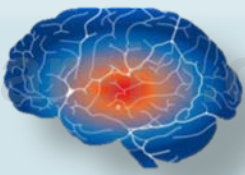
Infarctus cérébraux
Accidents ischémiques transitoires
Hémorragies sous-arachnoïdiennes
Hématomes
Thromboses veineuses

En France

- ➔ 100.000 à 150.000
- ➔ 3^{ème} Cause de mortalité
- ➔ 1^{ère} Cause de Handicap chez l'adulte
- ➔ 25% de décès dans les premiers mois
- ➔ 25% Récupèrent sans séquelles



Infarctus cérébraux: 85% des AVC



Historiquement

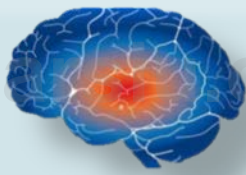
AVC
Pathologie
contemplative



En **2000**



AVC
Urgence
thérapeutique



Historiquement



USA A partir de 1996: rt-PA dans les 3h

Early stroke treatment associated with better outcome

The NINDS rt-PA Stroke Study

J.R. Marler, MD; B.C. Tilley, PhD; M. Lu, PhD; T.G. Brott, MD; P.C. Lyden, MD; J.C. Grotta, MD; J.P. Broderick, MD; S.R. Levine, MD; M.P. Frankel, MD; S.H. Horowitz, MD; E.C. Haley, Jr., MD; C.A. Lewandowski; and T.P. Kwiatkowski, MD, for the NINDS rt-PA Stroke Study Group*



J.R. Marler *NEUROLOGY* 2000;55:1649-1655

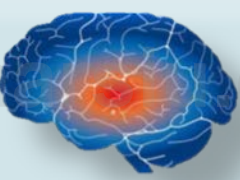
NEJM 1995;333 : 1581-1587

Time to treatment with intravenous alteplase and outcome in stroke: an updated pooled analysis of ECASS, ATLANTIS, NINDS, and EPITHET trials

Kennedy R Lees, Erich Bluhmki, Rüdiger von Kummer, Thomas G Brott, Danilo Toni, James C Grotta, Gregory W Albers, Markku Kaste, John R Marler, Scott A Hamilton, Barbara C Tilley, Stephen M Davis, Geoffrey A Donnan, Werner Hacke, for the ECASS, ATLANTIS, NINDS, and EPITHET rt-PA Study Group Investigators*

Interpretation Patients with ischaemic stroke selected by clinical symptoms and CT benefit from intravenous alteplase when treated up to 4·5 h. To increase benefit to a maximum, every effort should be taken to shorten delay in initiation of treatment. Beyond 4·5 h, risk might outweigh benefit.

Lancet 2010;375: 1695-703



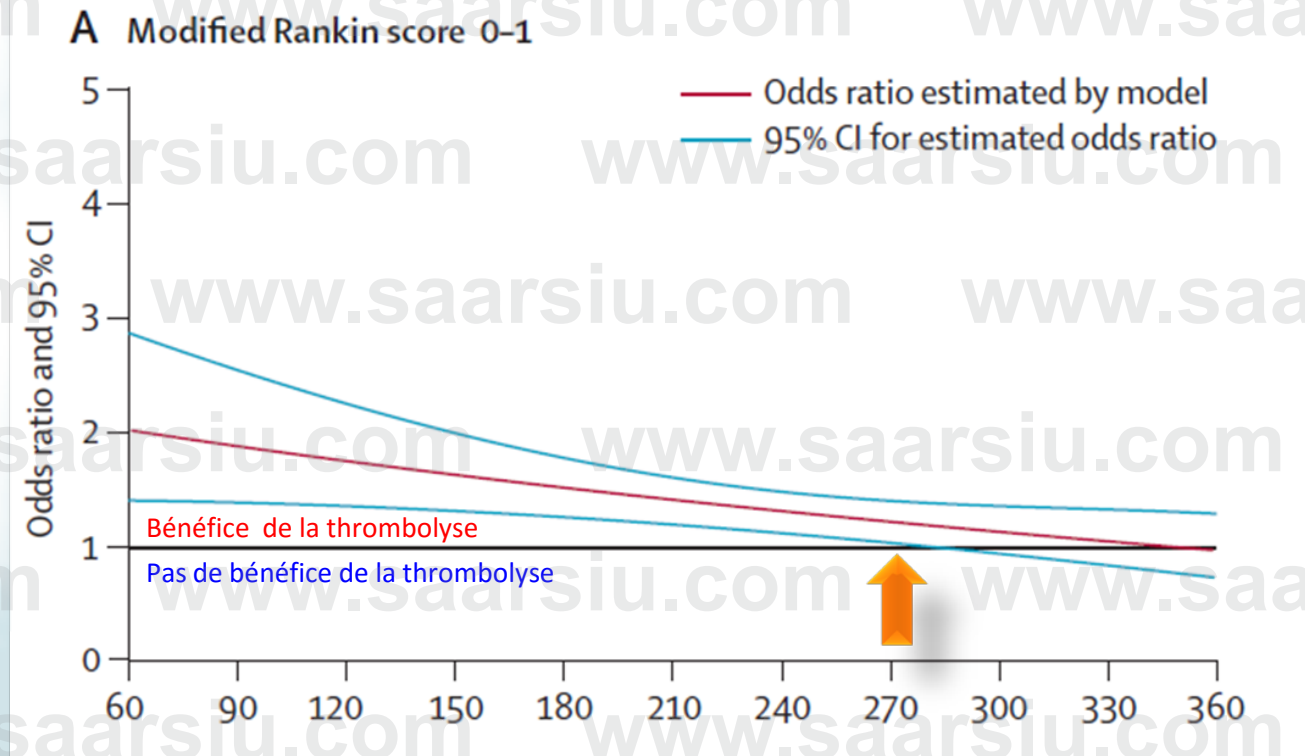
Time to treatment with intravenous alteplase and outcome in stroke: an updated pooled analysis of ECASS, ATLANTIS, NINDS, and EPITHET trials

Kennedy R Lees, Erich Bluhmki, Rüdiger von Kummer, Thomas G Brott, Danilo Toni, James C Grotta, Gregory W Albers, Markku Kaste, John R Marler, Scott A Hamilton, Barbara C Tilley, Stephen M Davis, Geoffrey A Donnan, Werner Hacke, for the ECASS, ATLANTIS, NINDS, and EPITHET rt-PA Study Group Investigators*

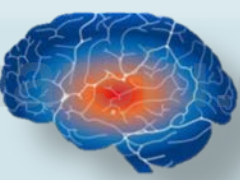
Lancet 2010; 375: 1695-703



Thrombolyse IV améliore le pronostic jusqu'à 270 min



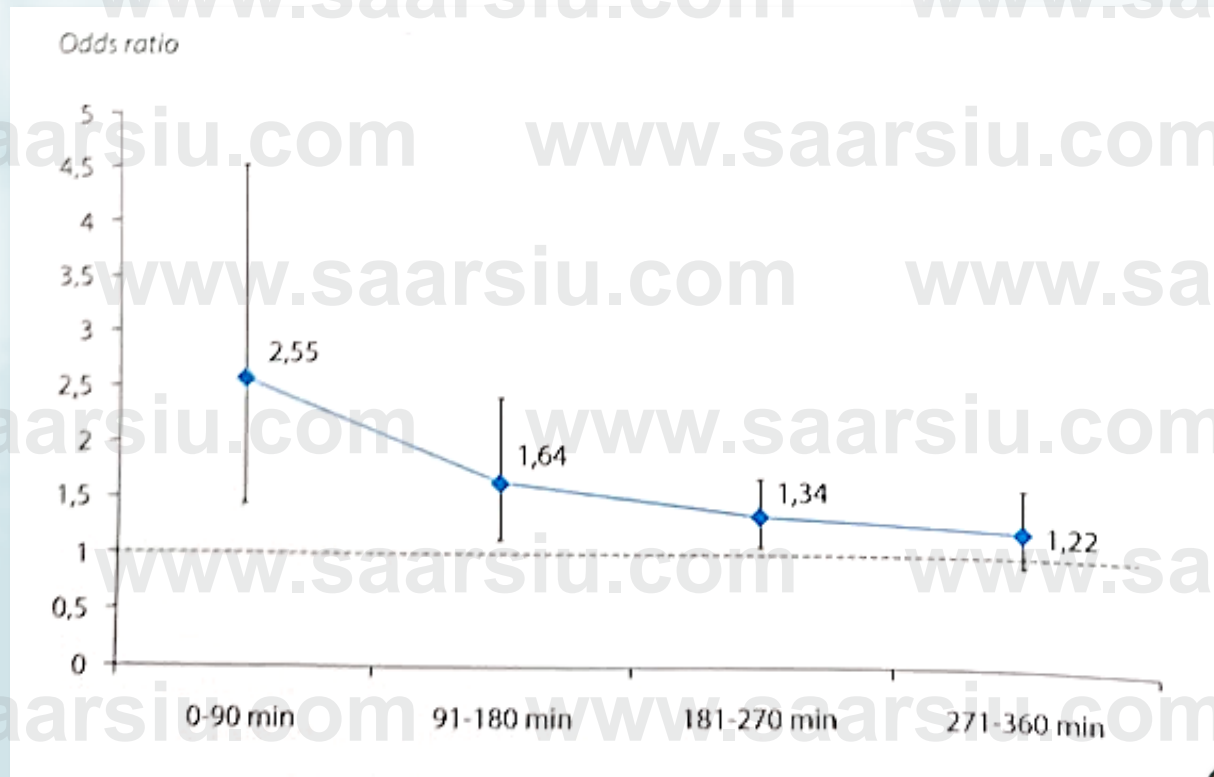
Interpretation Patients with ischaemic stroke selected by clinical symptoms and CT benefit from intravenous alteplase when treated up to 4·5 h. To increase benefit to a maximum, every effort should be taken to shorten delay in initiation of treatment. Beyond 4·5 h, risk might outweigh benefit.

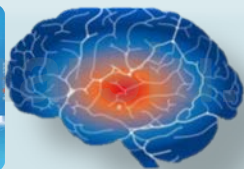


Wardlaw JM. *Lancet* 2012; 379:2364-72

Thrombolyse IV améliore le pronostic jusqu'à 360 min

Bénéfice du **rt-PA** en fonction du **délai** du traitement
par rapport au **début de symptômes** (Rankin 1-2)





Alerte

Secours

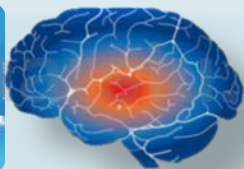
Déficit

**Sauver le maximum
de neurones**

**UNV
NIHSS**

**Thrombolyse
< 4-5 h**

Ischémie = Perte de **1.9** millions de neurones /minute



Plan AVC France 2010-2014



Filière AVC pour tout le territoire

➔ **UNV labellisées 140**

50 à 65% des AVC avec passage en UNV

➔ **Télémédecine**

30 Dispositifs / **23** Régions

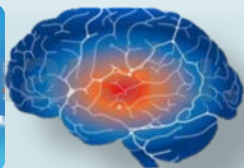
➔ **Déploiement IRM** sur tout le territoire 7J/7 et 24H/24



**SAMU-
Urgentistes**

Radiologie

**UNV-
Télémédecine**



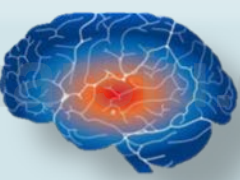
Recommandations Européennes et Américaines



Thrombolyse IV dans les 4H30 du début des symptômes

European Stroke Organisation (ESO) Executive Committee, ESO Writing Committee.
Guidelines for management of ischaemic stroke and transient ischaemic attack.
Cerebrovasc Dis. 2008;25:457–507.

Jauch EC et al. Guidelines for the early management of patients with acute ischemic stroke:
a guideline for healthcare professionals from the American Heart Association / American
Stroke Association. *Stroke.* 2013;44:870–947.

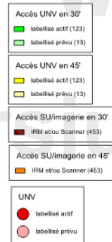
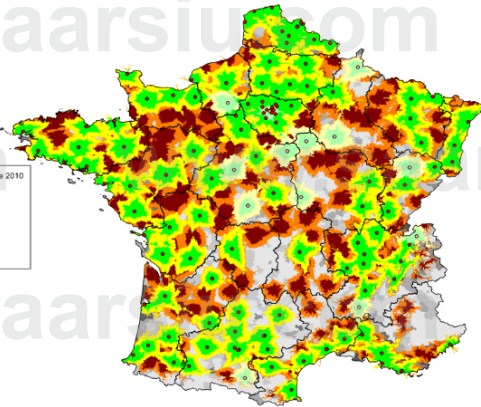


Gros système, peu d'élus....



Thrombolyse: 12 000/an

Temps d'accès aux Unités NeuroVasculaires (UNV) actuelles et prévues
et aux Urgences avec plateau d'imagerie



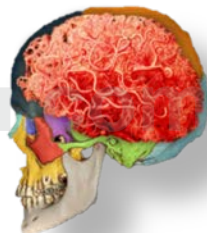
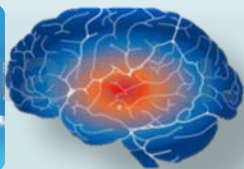
Plan AVC 2010-2014 - Ministère des Affaires Sociales et de la Santé / DGOS / R4-USID & ATH 01/2014



**Accès USINV-
télémédecine
70 000/an**

**AVC ischémique:
120 000/an**

TOTAL AVC: 150 0000/an



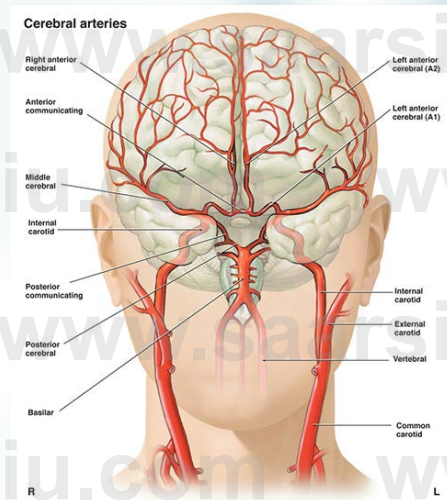
Résultats

- ➡ Faible proportion de patients éligibles au traitement: **10%**
- ➡ Efficacité limitée de la Thrombolyse IV avec un taux de **recanalisation faible**

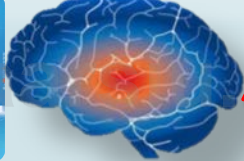
Occlusion de la carotide interne : **9%**

Occlusion de l'ACM proximale : **35%**

Occlusion de l'ACM distale: **66%**



Occlusions **proximales** donnent le plus de **handicaps et de mortalité**
Elles répondent le moins à la thrombolyse IV

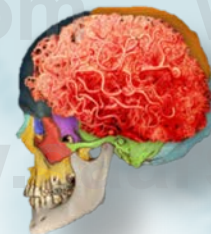
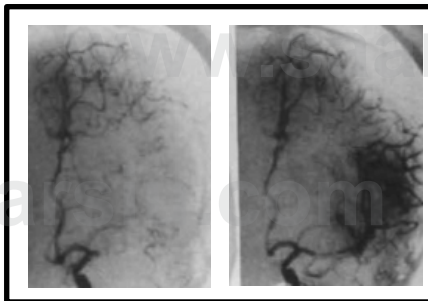


Recherche de nouvelles alternatives...



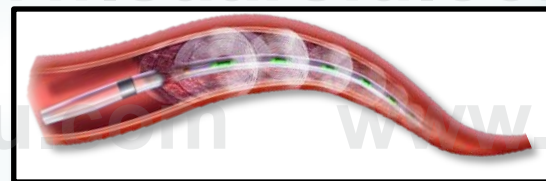
Thrombolyse intra-artérielle

Mori E et al. *Stroke*. 1988;19:802–12.



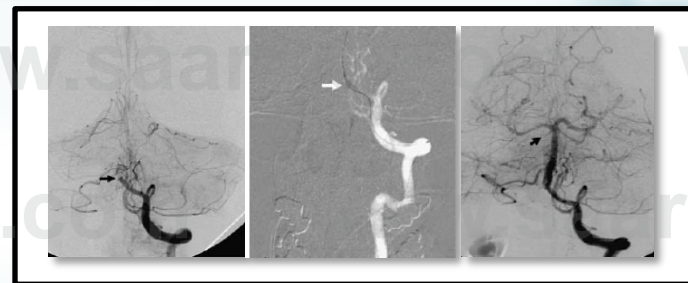
Dissolution du caillot par ultrasons

Mahon BR et al. *Am. J. Neuroradiol.* 2003;24:534–538.

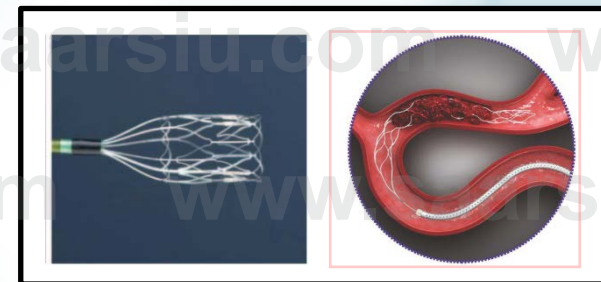
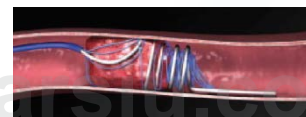


Angioplastie par ballon

Nogueira RG et al. *Neuroradiology*. 2008;50:331–340.



Thrombectomie mécanique

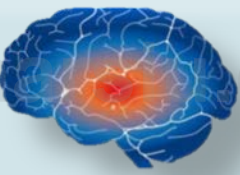


Smith WS et al. *Stroke*. 2008;39:1205–1212.

Rohde S et al. *J. Neurointerventional Surg.* 2012;4:455–458.

Penumbra Pivotal Stroke Trial Investigators. *Stroke*. 2009;40:2761–2768.

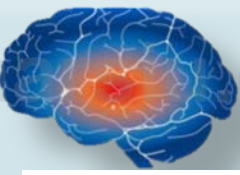




Essais randomisés

Techniques IA *vs* Thrombolyse IV





2013



SYNTHESIS expansion

(Intra-arteriel vs Systemic Thrombolysis for Acute Ischemic stroke)

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL A

Endovascular Treatment of Ischemic

Alfonso Ciavarella, M.D., Michele Nichelatti, Ph.D.,
Anna Maria Di Biase, M.D., Paolo Zio, Ph.D., Roberto Sterzi, M.D.,
and the SYNTHESIS Expansion Investigators*

ABSTRACT

Pas de supériorité de la thrombolyse IV par rapport à la thrombolyse IV

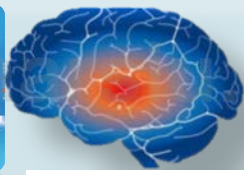
ECHEC

Endovascular Therapy for Acute Ischemic Stroke

Alfonso C. C. D., Michele Nichelatti, Ph.D.,
Annunzio, Ph.D., Roberto Sterzi, M.D.,
and SYNTHESIS Expansion Investigators*

ABSTRACT

This trial in patients with acute ischemic stroke indicate that endovascular therapy is not superior to standard treatment with intravenous t-PA. (Funded by the Italian Medicines Agency, ClinicalTrials.gov number, NCT00640367.)



2013



IMSIII

(the Interventionnel Management of Stroke)

The NEW ENGL JOURNAL of Medicine

ESTABLISHED IN 1812

MARCH 7, 2013

NO. 10

Endovascular Therapy for Acute Ischemic Stroke versus t-PA Alone

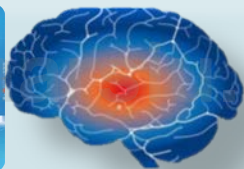
Joseph P. Broderick, M.D., Michael S. Bruno, M.D., Sharon D. Yeatts, Ph.D.,
Pooja Khatri, M.D., Michael J. Hill, M.D., Tudor G. Jovin, M.D., Bernard Yan, M.D.,
Frank L. Silver, M.D., Alexander A. Molina, M.D., Bart M. Demaerschalk, M.D.,
Ronald Budzik, M.D., Michael D. Hill, M.D., Tim W. Malisch, M.D., Mayank Goyal, M.D.,
Wouter J. Schoneveld, M.D., Stefan T. Engelter, M.D., Craig Anderson, M.D., Ph.D.,
Judith S. Stein, M.D., B.A., R.T.(R.), Karla J. Ryckborst, R.N., B.N., L. Scott Janis, Ph.D.,
D. Foster, M.S., and Thomas A. Tomsick, M.D.,
Management of Stroke (IMS) III Investigators

ABSTRACT

...similar safety outcomes and no significant difference in functional
outcomes with endovascular therapy after intravenous t-PA, as compared with
t-PA alone. (Funded by the National Institutes of Health and others;
ClinicalTrials.gov number, NCT00359424.)

Pas de supériorité de la thrombectomie après thrombolyse IV par rapport à la thrombolyse IV seule

ECHEC



2013



ORIGINAL ARTICLE

A Trial of Imaging-Selected Endovascular Treatment for Acute Ischemic Stroke

Chelsea S. Kidwell, M.D., Jeffrey R. Alger, Ph.D., Val M. ... Dr.P.H.,
Jeffrey R. Alger, Ph.D., Val M. ... Feng, M.D., Ph.D.,
Brett C. Meyer, M.D., S. ... M.D., Albert J. Yoo, M.D.,
Randolph S. M. ... Dileep R. Yavagal, M.D.,
Max W. ... Sidney Starkman, M.D.,
... RESCUE Investigators*

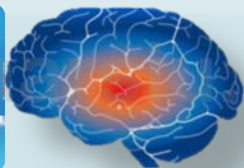
ABSTRACT

Pas de supériorité de la thrombolyse IV par rapport à la thrombectomie

ECHEC

MR RESCUE

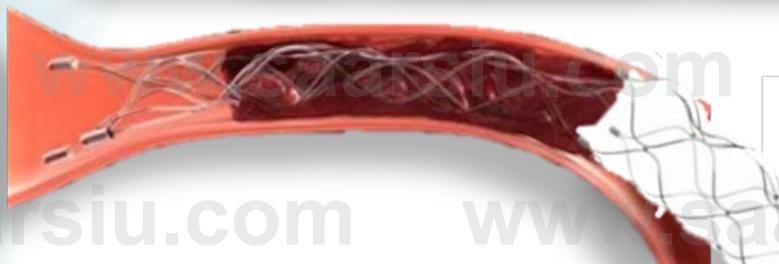
(Magnetic Resonance and Recanalization of Stroke Clots Using Embolectomy)



2015

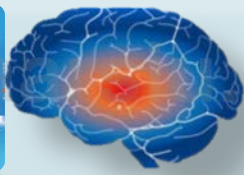


Année de la Thrombectomie mécanique (TM)



A Multicenter Randomized CLinical trial of Endovascular treatment for Acute ischemic stroke in the Netherlands





2015



Année de la **Thrombectomie mécanique (TM)**



The NEW ENGLAND JOURNAL *of* MEDICINE

ESTABLISHED IN 1812

JANUARY 1, 2015

VOL. 372 NO. 1

A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

O.A. Berkhemer, P.S.S. Fransen, D. Beumer, L.A. van den Berg, H.F. Lingsma, A.J. Yoo, W.J. Schonewille, J.A. Vos,

N ENGL J MED 372;1 NEJM.ORG JANUARY 1, 2015

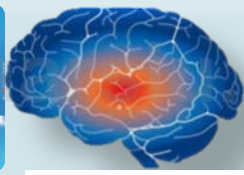


Etude multicentrique randomisée

16 centres aux Pays Bas

500 patients: 233 TM - 267 traitement standard

Thrombectomie mécanique vs Thrombolyse IV



2015

Année de la
Thrombectomie mécanique (TM)



A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

O.A. Berkhemer, P.S.S. Fransen, D. Beumer, L.A. van den Berg, H.F. Lingsma, A.J. Yoo, W.J. Schonewille, J.A. Vos,

N ENGL J MED 372;1 NEJM.ORG JANUARY 1, 2015

In conclusion, that intraarterial treatment in acute ischemic stroke caused by intracranial occlusion of the circulation was effective and safe when administered within 6 hours after stroke

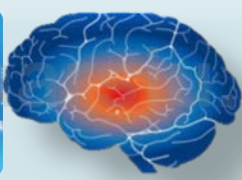
Efficacité de la Thrombectomie mécanique IV par rapport à la thrombolyse IV

- AVC is
- Circulation
- Arteries



Patients (%)

Figure 1. Modified Rankin Scale Scores at 90 Days in the Intention-to-Treat Population.
odds ratio, 1.66; 95% CI, 1.21 to 2.28)



2015

Année de la Thrombectomie mécanique (TM)



ESCAPE Goyal M et al. NEJM 2015;372:1019–1030.

Randomized Endovascular Thrombectomy

M. Goyal, A.M. Demchuk, B.K. T.G. Jovin, R.A. Willinsky, B.L. W.J. Montaner, A.Y. Poppe, D. Williams, O.Y. Bang, C.A. Holmstedt, B. Jankowitz, S.-I. Sohn, R.H. Swartz, P.A. A. Weill, S. Subramanian, T.T. Sajobi, and M.D.

BACKGROUND

Among patients with a proximal anterior intracranial arterial occlusion, despite alteplase treatment to standard care in patients with proximal intracranial arterial occlusion.

METHODS

We randomly assigned participants to receive intravenous alteplase plus endovascular treatment (intervention group). Patients with a proximal anterior intracranial arterial occlusion or poor collateral circulation were excluded. Work-flow times from primary outcome was the score on the modified Rankin scale at 90 days. A proportional odds ratio as a measure of the effect of the intervention on the modified Rankin scale.

RESULTS

The trial was stopped early because of a high rate of symptomatic intracranial hemorrhage in the intervention group. Of 210 patients enrolled, of whom 207 were included in the primary outcome analysis, 103 were in the intervention group and 104 in the control group. The median time from qualifying imaging to groin puncture was 57 minutes, and the rate of substantial reperfusion at the end of the procedure was 88%. Thrombectomy with the stent retriever plus intravenous t-PA reduced disability at 90 days over the entire range of scores on the modified Rankin scale ($P < 0.001$). The rate of functional independence (modified Rankin scale score, 0 to 2) was higher in the intervention group than in the control group (60% vs. 35%, $P < 0.001$). There were no significant between-group differences in 90-day mortality (9% vs. 12%, $P = 0.50$) or symptomatic intracranial hemorrhage (0% vs. 3%, $P = 0.12$).

CONCLUSIONS

Among patients with acute ischemic stroke, intravenous alteplase plus endovascular treatment improved functional outcomes compared with alteplase alone. ESCAPE ClinicalTrials.gov

N ENGL J MED

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EXTEND-IA Campbell BCV et al NEJM .2015;372:1009–1018

Endovascular Thrombectomy with Perfusion Imaging

B.C.V. Campbell, P.J. Mitchell, B. Yan, R.J. Dowling, M.V. M.A. Simpson, F. Miteff, C.R. B.S. Steinfert, M. Priglinger, T. Wijeratne, T.G. Phan, W. Cho, L. de Villiers, H. Ma, P.M. for the E

BACKGROUND

Trials of endovascular therapy for acute ischemic stroke have shown promising results. We conducted this study to test whether endovascular treatment with perfusion imaging would improve outcomes compared with standard care.

METHODS

We randomly assigned patients with acute ischemic stroke either to undergo endovascular treatment with perfusion imaging (Flow Restoration) stent retriever (Flow Restoration) stent retriever patients had occlusion of the internal carotid artery and imaging (CT) perfusion imaging. Trial and early neurologic improvement on the Health Stroke Scale or a score of functional score on the modified Rankin scale.

RESULTS

The trial was stopped early because of a high rate of symptomatic intracranial hemorrhage in the intervention group. Of 210 patients enrolled, of whom 207 were included in the primary outcome analysis, 103 were in the intervention group and 104 in the control group. The median time from qualifying imaging to groin puncture was 57 minutes, and the rate of substantial reperfusion at the end of the procedure was 88%. Thrombectomy with the stent retriever plus intravenous t-PA reduced disability at 90 days over the entire range of scores on the modified Rankin scale ($P < 0.001$). The rate of functional independence (modified Rankin scale score, 0 to 2) was higher in the intervention group than in the control group (60% vs. 35%, $P < 0.001$). There were no significant between-group differences in 90-day mortality (9% vs. 12%, $P = 0.50$) or symptomatic intracranial hemorrhage (0% vs. 3%, $P = 0.12$).

CONCLUSIONS

In patients with ischemic stroke, intravenous alteplase plus endovascular treatment with perfusion imaging improved functional outcomes compared with alteplase alone. EXTEND-IA ClinicalTrials.gov

N ENGL J MED

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REVASCATE Jovin TG et al. NEJM 2015;372:2296–2306

rs' full names, academic degrees, and affiliations are listed in the Appendix. Address reprint requests to Dr. Jovin at the Department of Neurology, Hospital Germans Trias i Pujol, Autònoma de Barcelona, Avda. d'Europa 28916, Barcelona, Spain; dlores.germanstria@gencat.cat.

and Dávalos contributed equally to this work.

ite list of sites and investigators who participated in the Revascate randomized Trial of Revascate with Solitaire FR Device versus Standard Therapy in the Treatment of Acute Ischemic Stroke (Revasc). Stroke Due to Anterior Circulation Occlusive Stroke Presenting within 6 Hours of Symptom Onset (AT) is provided in the Supplementary Appendix, available at NEJM.org.

was published on April 17, 2015, in NEJM.

doi:10.1056/NEJMoa1503780
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SWIFT-PRIME Saver JL . NEJM 2015;372:2285–2295.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

JUNE 11, 2015

VOL. 372 NO. 24

Stent-Retriever Thrombectomy after Intravenous t-PA vs. t-PA Alone in Stroke

Jeffrey L. Saver, M.D., Mayank Goyal, M.D., Alain Bonafe, M.D., Hans-Christoph Diener, M.D., Ph.D., Elad I. Levy, M.D., Vitor M. Pereira, M.D., Gregory W. Albers, M.D., Christophe Cognard, M.D., David J. Cohen, M.D., Werner Hacke, M.D., Ph.D., Olav Jansen, M.D., Ph.D., Tudor G. Jovin, M.D., Heinrich P. Mattle, M.D., Raul G. Nogueira, M.D., Adnan H. Siddiqui, M.D., Ph.D., Dileep R. Yavagal, M.D., Blaise W. Baxter, M.D., Thomas G. Devlin, M.D., Ph.D., Demetrius K. Lopes, M.D., Vivek K. Reddy, M.D., Richard du Mesnil de Rochemont, M.D., Oliver C. Singer, M.D., and Reza Jahan, M.D., for the SWIFT PRIME Investigators*

ABSTRACT

BACKGROUND

Among patients with acute ischemic stroke due to occlusions in the proximal anterior intracranial circulation, less than 40% regain functional independence when treated with intravenous tissue plasminogen activator (t-PA) alone. Thrombectomy with the use of a stent retriever, in addition to intravenous t-PA, increases reperfusion rates and may improve long-term functional outcome.

METHODS

We randomly assigned eligible patients with stroke who were receiving or had received intravenous t-PA to continue with t-PA alone (control group) or to undergo endovascular thrombectomy with the use of a stent retriever within 6 hours after symptom onset (intervention group). Patients had confirmed occlusions in the proximal anterior intracranial circulation and an absence of large ischemic-core lesions. The primary outcome was the severity of global disability at 90 days, as assessed by means of the modified Rankin scale (with scores ranging from 0 [no symptoms] to 6 [death]).

RESULTS

The study was stopped early because of efficacy. At 39 centers, 196 patients underwent randomization (98 patients in each group). In the intervention group, the median time from qualifying imaging to groin puncture was 57 minutes, and the rate of substantial reperfusion at the end of the procedure was 88%. Thrombectomy with the stent retriever plus intravenous t-PA reduced disability at 90 days over the entire range of scores on the modified Rankin scale ($P < 0.001$). The rate of functional independence (modified Rankin scale score, 0 to 2) was higher in the intervention group than in the control group (60% vs. 35%, $P < 0.001$). There were no significant between-group differences in 90-day mortality (9% vs. 12%, $P = 0.50$) or symptomatic intracranial hemorrhage (0% vs. 3%, $P = 0.12$).

CONCLUSIONS

In patients receiving intravenous t-PA for acute ischemic stroke due to occlusions in the proximal anterior intracranial circulation, thrombectomy with a stent retriever within 6 hours after onset improved functional outcomes at 90 days. (Funded by Covidien; SWIFT PRIME ClinicalTrials.gov number, NCT01657461.)

The authors' affiliations are listed in the Appendix. Address reprint requests to Dr. Saver at the UCLA Stroke Center, 710 Westwood Plaza, Los Angeles, CA 90095, or at jsaver@mednet.ucla.edu.

Drs. Saver and Goyal contributed equally to this article.

*A complete list of investigators in the Solitaire with the Intention for Thrombectomy as Primary Endovascular Treatment (SWIFT PRIME) trial is provided in the Supplementary Appendix, available at NEJM.org.

This article was published on April 17, 2015, at NEJM.org.

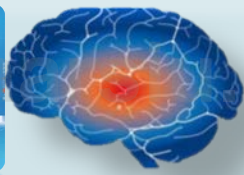
N Engl J Med 2015;372:2285-95.
DOI: 10.1056/NEJMoa1415061
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N ENGL J MED 372:24 NEJM.ORG JUNE 11, 2015

The New England Journal of Medicine

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2285



2016



Mechanical thrombectomy after intravenous alteplase versus alteplase alone after stroke (THRACE): a randomised controlled trial

Serge Bracad, Xavier Ducrocq, Jean Louis Mas, Marc Soudant, Catherine Oppenheim, Thierry Moulin, Francis Guillemin, on behalf of the THRACE investigators*

Summary

Background Intravenous thrombolysis with alteplase alone cannot reperfuse most large-artery stroke. We aimed to determine whether mechanical thrombectomy in addition to intravenous thrombolysis improves clinical outcomes in patients with acute ischaemic stroke.

Methods THRACE is a randomised controlled trial done in 26 centres in France. Patients aged 18–80 years with acute ischaemic stroke and proximal cerebral artery occlusion were randomly assigned to receive either intravenous thrombolysis alone (IVT group) or intravenous thrombolysis plus mechanical thrombectomy (IVTMT group). Intravenous thrombolysis (alteplase 0·9 mg/kg [maximum 90 mg], with an initial bolus of 10% of the total dose followed by infusion of the remaining dose over 60 min) had to be started within 4 h and thrombectomy within 5 h of symptom onset. Occlusions had to be confirmed by CT or magnetic resonance angiography. Randomisation was done centrally with a computer-generated sequential minimisation method and was stratified by centre. The primary outcome was the proportion of patients achieving functional independence at 3 months, defined by a score of 0–2 on the modified Rankin scale, assessed in the modified intention-to-treat population (ie, patients lost to follow-up and those with missing data were excluded). Safety outcomes were analysed in the per-protocol population (ie, all patients who did not follow the protocol of their randomisation group precisely were excluded from the analysis). THRACE is registered with ClinicalTrials.gov, NCT01062698.

Findings Between June 1, 2010, and Feb 22, 2015, 414 patients were randomly assigned to the IVT group (n=208) or the IVTMT group (n=204). Four patients (two in each group) lost to follow-up and six (four in the IVT group and two in the IVTMT group) with missing data were excluded. 85 (42%) of 202 patients in the IVT group and 106 (53%) of 200 patients in the IVTMT group achieved functional independence at 3 months (odds ratio 1·55, 95% CI 1·05–2·30; p=0·028). The two groups had no significant differences in mortality at 3 months (24 [12%] deaths of 202 patients vs 27 [13%] of 206; p=0·70) or symptomatic intracranial haemorrhage at 24 h (four [2%] of 185 vs three [2%] of 192; p=0·71). Common adverse events related to thrombectomy were vasospasm (33 [23%] patients) and embolisation in a new territory (nine [6%]).

Interpretation Mechanical thrombectomy combined with standard intravenous thrombolysis improves functional independence in patients with acute cerebral ischaemia, with no evidence of increased mortality. Bridging therapy should be considered for patients with large-vessel occlusions of the anterior circulation.

Funding French Ministry for Health.

Lancet Neurol 2016; 15: 1138–47

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51474-4422(16)30177-6

This online publication has been corrected.

The corrected version first appeared at thelancet.com/neurology on October 10, 2016

See [Comment](#) page 1105

*THRACE investigators listed at end of paper

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and Department of

Neuroradiology (Prof C Oppenheim PhD),

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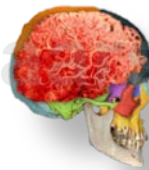
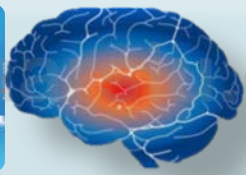
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(Prof T Moulin MD)

Correspondence to:



THE LANCET **Neurology**



Thrombectomie largement supérieure Au traitement standard (thrombolyse)

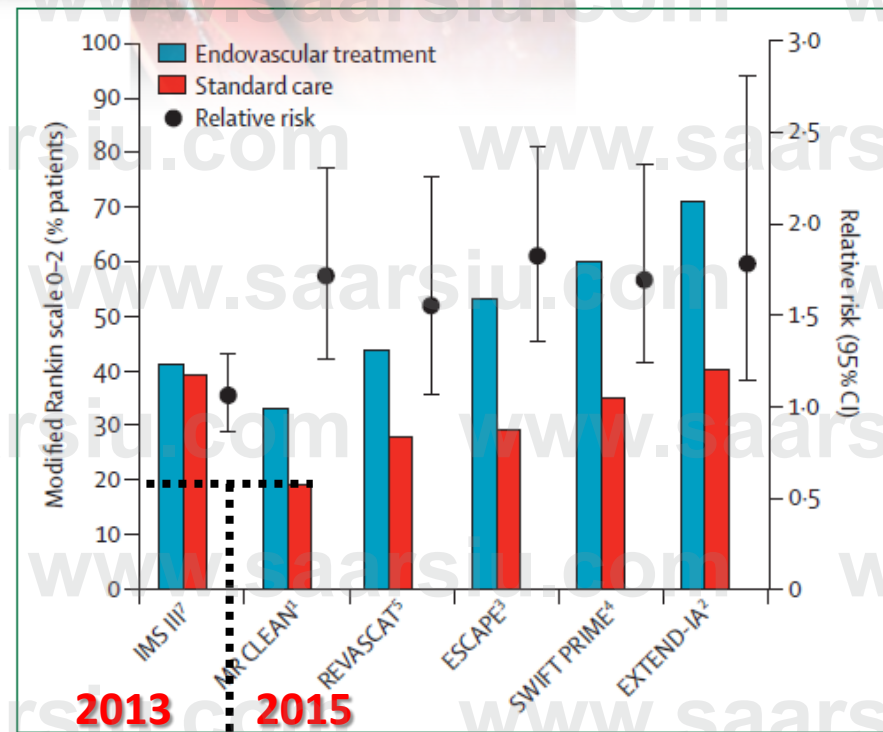
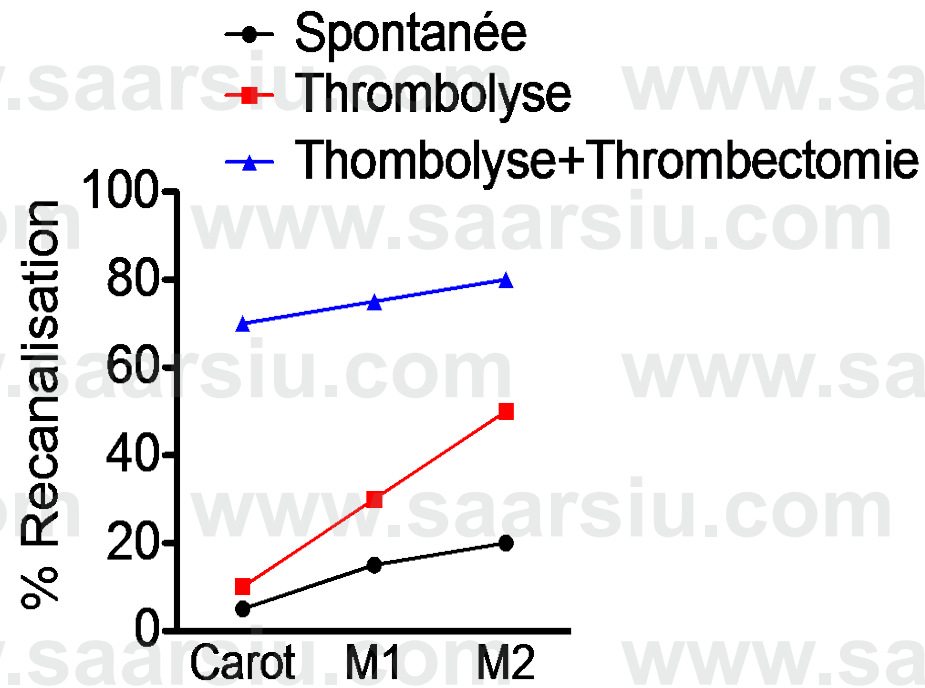
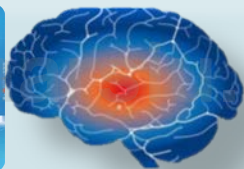


Figure 1: Functional outcome of patients with ischaemic stroke in trials of endovascular thrombectomy

Lancet Neurol 2015; 14: 846-54



Alerte

Secours

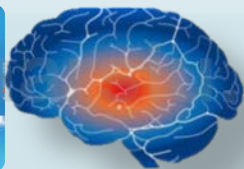
Déficit

**Sauver le maximum
de neurones**

**UNV
NIHSS**

Thrombectomie < 6h

**Thrombolyse
< 4-5 h**



SAMU-URGENTISTE



**Unité
Neuro-vasculaire**

Radiologie

**URGENCES
Télémédecine**

Décision de thrombolyse

SI Segment Proximal
Délai prévu pour ponction < 6H

**Indication de
Thrombectomie**



Unité Neuro-vasculaire

**Centre avec
Neuro-Radiologie
Interventionnelle
NRI**

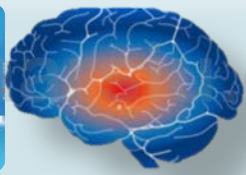
**Plateau technique complet 24/7:
Accueil administratif
NRI, manip radio,
A-Rea, IADE, SSPI fonctionnel**

DRIP and SHIP



MOTHERSHIP





Unité Neuro-vasculaire

**Centre avec
Neuro-Radiologie
Interventionnelle
NRI**

**Plateau technique complet 24/7:
Accueil administratif
NRI, manip radio,
A-Rea, IADE, SSPI fonctionnel**



Neuroradiologue



Neurologue vasculaire



Thrombolyse

Thrombectomie

**Neuroradiologue
interventionnel**

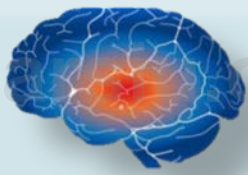


**Nouvelle organisation
Nouveaux moyens**



Anesthésiste-Réanimateur





Thrombectomie mécanique (TM)



En pratique

Indications initiales

« règle » des 6

👉 Délai $\leq 6h$

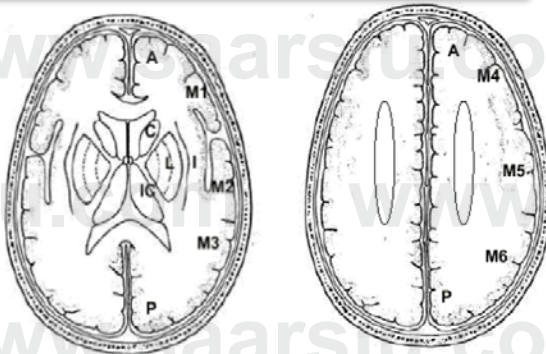
👉 ASPECT score ≥ 6

👉 NIHSS ≥ 6

👉 Occlusion proximale

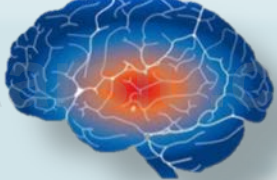
Alberta stroke programme early CT score

- Caudé (C)
- Lenticulaire (L)
- Insulaire (I)
- Capsule interne (IC)
- MCA 1 (M1)
- MCA 2 (M2)
- MCA 3 (M3)
- MCA 4 (M4)
- MCA 5 (M5)
- MCA 6 (M6)



Score NIHSS

Item	Intitulé	cotation	score
1a	vigilance	0 vigilance normale, réactions vives 1 trouble léger de la vigilance : obnubilation, éveil plus ou moins adapté aux stimulations environnantes 2 coma : réactions adaptées aux stimulations nociceptives 3 coma grave : réponse stéréotypée ou aucune réponse motrice	
1b	orientation (mois, âge)	0 deux réponses exactes 1 une seule bonne réponse 2 pas de bonne réponse	
1c	commandes (ouverture des yeux, ouverture du poing)	0 deux ordres effectués 1 un seul ordre effectué 2 aucun ordre effectué	
2	oculomotricité	0 oculomotricité normale 1 ophtalmoplogie partielle ou déviation réductible du regard 2 ophtalmoplogie horizontale complète ou déviation forcée du regard	
3	champ visuel	0 champ visuel normal 1 quadranopsie latérale homonyme ou hémianopsie incomplète ou négligence visuelle unilatérale 2 hémianopsie latérale homonyme franche 3 cécité bilatérale ou coma (la=3)	
4	paralysie faciale	0 motricité faciale normale 1 asymétrie faciale modérée (paralysie faciale unilatérale incomplète) 2 paralysie faciale unilatérale centrale franche 3 paralysie faciale périphérique ou diplogie faciale	
5	motricité membre supérieur	0 pas de déficit moteur proximal 1 affaissement dans les 10 secondes, mais sans atteindre le plan du lit. 2 effort contre la pesanteur, mais le membre chute dans les 10 secondes sur le plan du lit. 3 pas d'effort contre la pesanteur (le membre chute mais le patient peut faire un mouvement tel qu'une flexion de hanche ou une adduction.) 4 absence de mouvement (coter 4 si le patient ne fait aucun mouvement volontaire) X cotation impossible (amputation, arthrodèse)	Dt G
6	motricité membre inférieur	0 pas de déficit moteur proximal 1 affaissement dans les 5 secondes, mais sans atteindre le plan du lit. 2 effort contre la pesanteur, mais le membre chute dans les 5 secondes sur le plan du lit. 3 pas d'effort contre la pesanteur (le membre chute mais le patient peut faire un mouvement tel qu'une flexion de hanche ou une adduction.) 4 absence de mouvement (le patient ne fait aucun mouvement volontaire) X cotation impossible (amputation, arthrodèse)	Dt G
7	ataxie	0 ataxie absente 1 ataxie présente pour 1 membre 2 ataxie présente pour 2 membres ou plus	
8	sensibilité	0 sensibilité normale 1 hypoesthésie minime à modérée 2 hypoesthésie sévère ou anesthésie	
9	langage	0 pas d'aphasie 1 aphasie discrète à modérée : communication informative 2 aphasie sévère 3 mutisme : aphasie totale	
10	dysarthrie	0 normal 1 dysarthrie discrète à modérée 2 dysarthrie sévère X cotation impossible	
11	extinction, négligence	0 absence d'extinction et de négligence 1 extinction dans une seule modalité, visuelle ou sensitive, ou négligence partielle auditive, spatiale ou personnelle. 2 négligence sévère ou anosognosie ou extinction portant sur plus d'une modalité sensorielle	
TOTAL			



Thrombectomie: 6000/an
5%

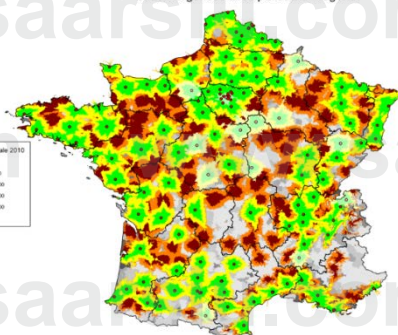
Thrombolyse: 12 000/an
10%

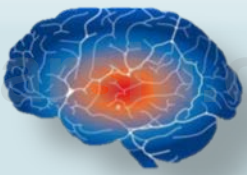
**Accès USINV-
télémédecine**
70 000/an

AVC ischémique:
120 000/an

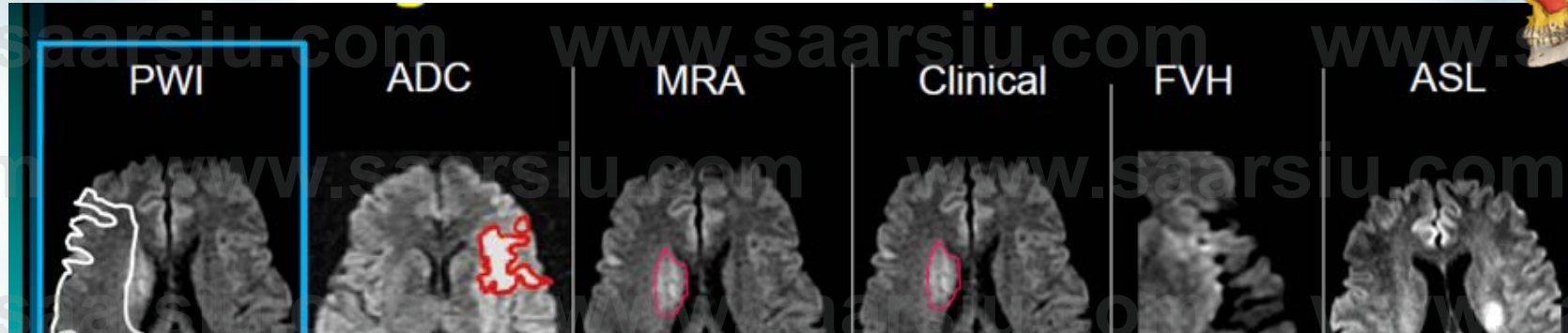
TOTAL AVC: 150 0000/an

Temps d'accès aux Unités NeuroVasculaires (UNV) actuelles et prévues
et aux Urgences avec plateau d'imagerie

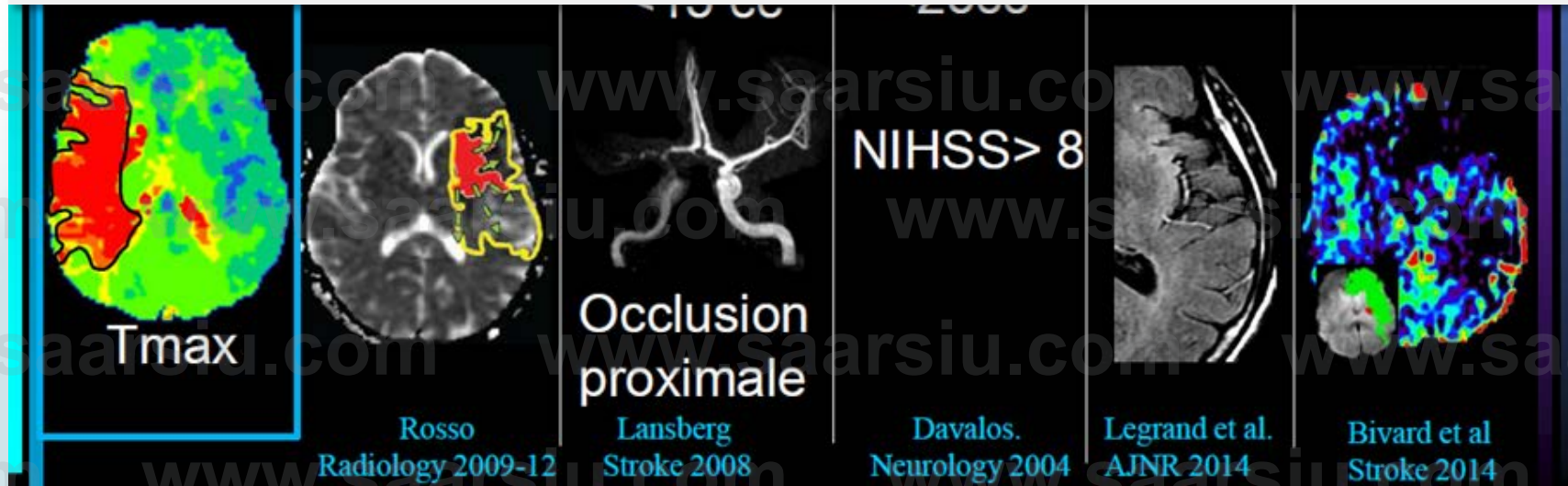


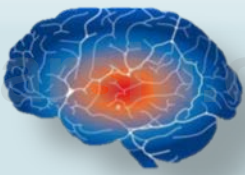


Thrombectomie mécanique (TM)

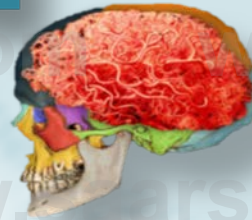


Délai (> 6H) vs mismatch ?





Thrombectomie mécanique (TM)



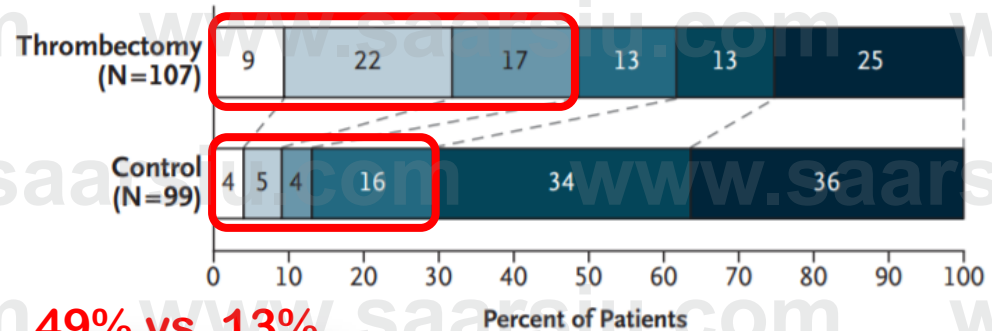
Délai > 6H vs mismatch ?

TM 6-16 H

DAWNTM
TRIAL

The NEW ENGLAND
JOURNAL of MEDICINE

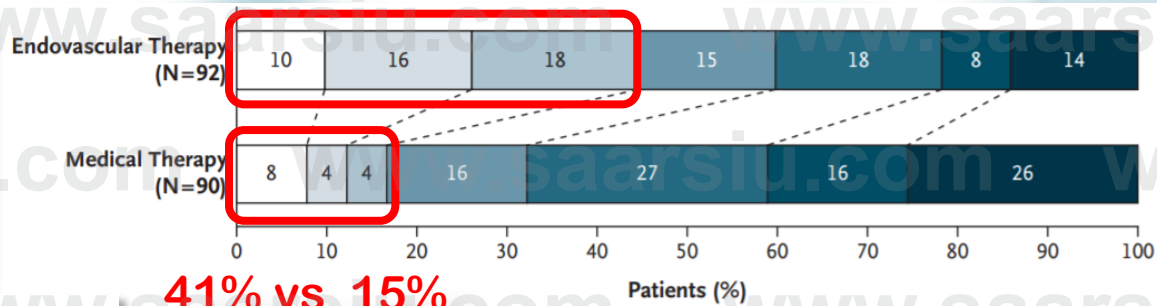
Albers GW et al. Thrombectomy for Stroke at **6 to 16 Hours**
with Selection by Perfusion Imaging.
N. Engl. J. Med. **2018**;378:708–718.



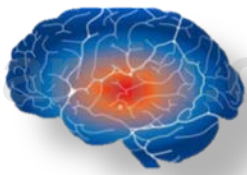
TM 6-24 H

The NEW ENGLAND
JOURNAL of MEDICINE

Nogueira RG et al. Thrombectomy **6 to 24 Hours**
after Stroke with a Mismatch between Deficit and Infarct.
N. Engl. J. Med. **2018**;378:11–21.



**Amélioration spectaculaire
du pronostic fonctionnel à 3 mois**



Thrombectomie mécanique (TM)



Délai > 6H vs mismatch ?

TM 6-16 H

DAWN
TRIAL

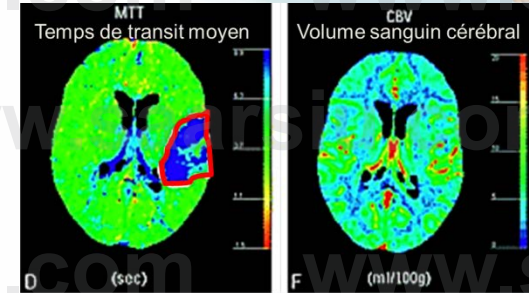
The NEW ENGLAND
JOURNAL of MEDICINE

Albers GW et al. Thrombectomy with Selection by Perfusion Imaging in Patients with Acute Ischemic Stroke. *N. Engl. J. Med.* 2018;378:708-716.

TM 6-24 H

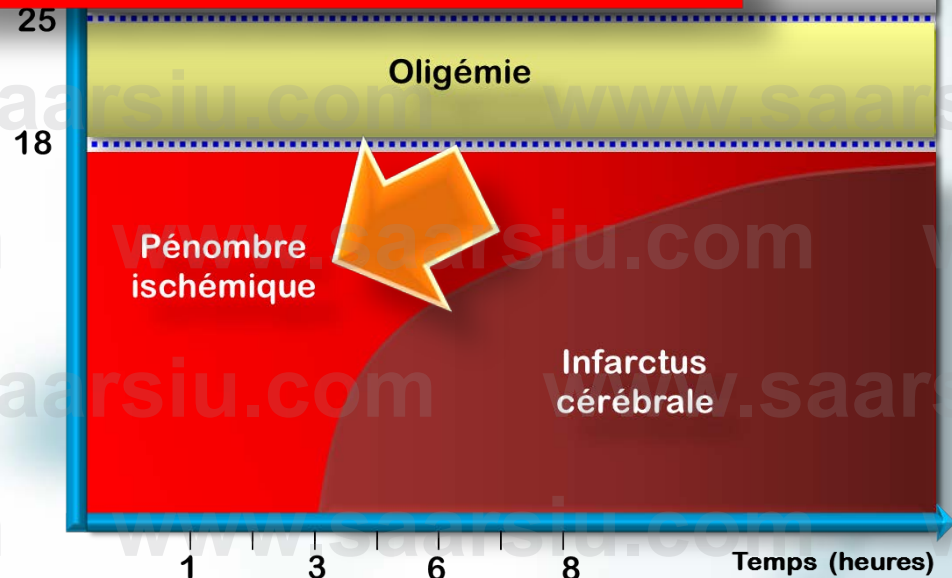
The NEW ENGLAND
JOURNAL of MEDICINE

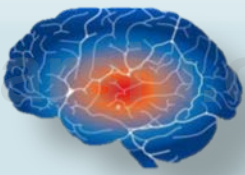
Nogueira RG et al. Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct. *N. Engl. J. Med.* 2018;378:11-21.



DSC
ml/100g/mn

Rôle majeur des artères collatérales





Thrombectomie mécanique (TM)



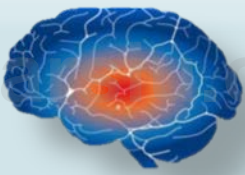
Question

**Anesthésie
générale**



**Sédation
consciente**

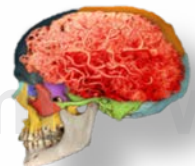


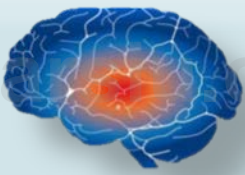


Thrombectomie mécanique (TM)



- ➡ Peu d'infos sur la PEC anesthésique des TM (% de geste sous AG)
- ➡ Pas d'info sur protocole d'anesthésie ou sédation.
- ➡ Pas d'info sur l'équipe anesthésie
- ➡ Peu d'infos sur la gestion de l'hémodynamique et objectifs PA.
- ➡ Pas d'anesthésiste dans la rédaction des articles
- ➡ Moins d'AG entre 7 et 38% (2012 et 2014) vs 70% (année 2010)
- ➡ Plus de sédation entre 62 et 93%
- ➡ Pas d'étude en sous groupe sur le type d'anesthésie





Thrombectomie mécanique (TM)

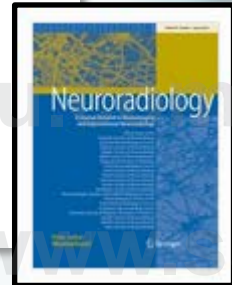


Neuroradiology (2013) 55:93–100
DOI 10.1007/s00234-012-1084-y

INTERVENTIONAL NEURORADIOLOGY

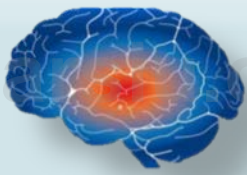
Is general anaesthesia preferable to conscious sedation in the treatment of acute ischaemic stroke with intra-arterial mechanical thrombectomy? A review of the literature

N. John • P. Mitchell • R. Dowling • B. Yan



Conclusion Intra-arterial mechanical thrombectomy under general anaesthesia is associated with poor outcomes in observational studies. It is reasonable to offer conscious sedation as the preferred option where adverse patient factors such as agitation are lacking.

La TM sous AG est associée à une mauvaise évolution



Thrombectomie mécanique (TM)



Conscious Sedation Versus General Anesthesia During Endovascular Therapy for Acute Anterior Circulation Stroke

Preliminary Results From a Retrospective, Multicenter Study

Abou-Chebl . Stroke 2010

Anesthésie générale

*Facteur prédictif
Indépendant de*

Mauvais devenir

Table 3.
Endovascular

Variable

Age

NIHSS score

GA

TIMI 0/1

Symptom

Asymptom

Carotid terminus occlusion

Stent placement

After

Table 4. Independent Predictors of Mortality After Endovascular Therapy for AIS

P Value

0.0001

0.0001

0.0005

0.0001

0.015

0.0001

0.04

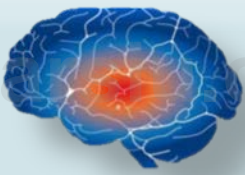
0.044

TIMI indica
hemorrhage.

Anesthésie générale

*Facteur prédictif
Indépendant de*

Mortalité

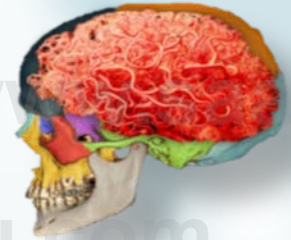


Thrombectomie mécanique (TM)



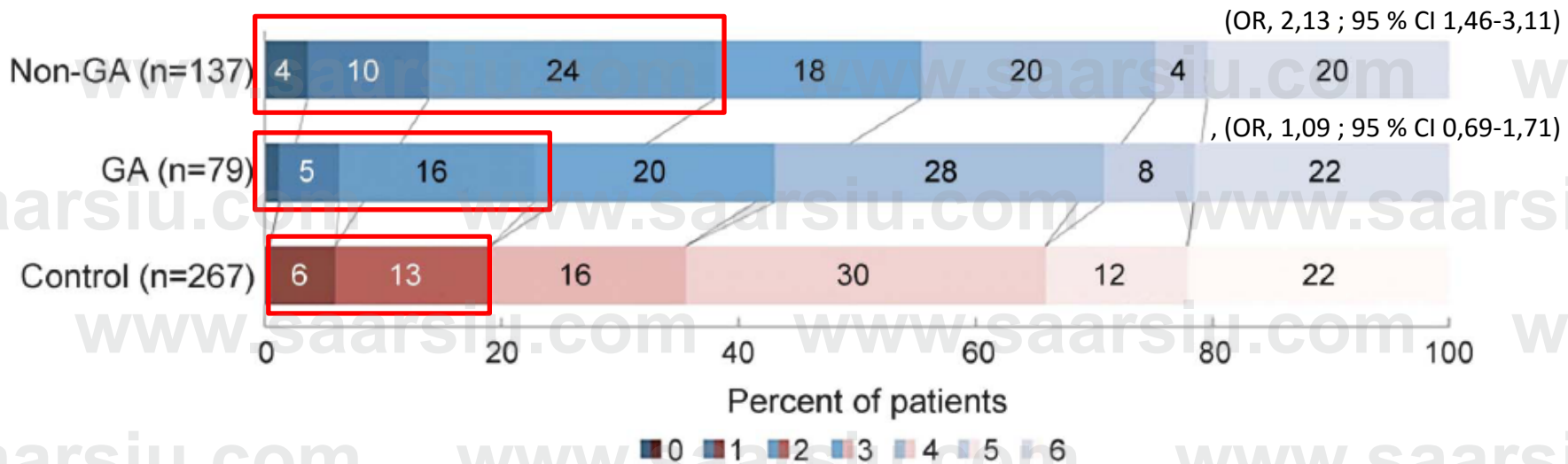
The effect of anesthetic management during intra-arterial therapy for acute stroke in MR CLEAN

Neurology 87 August 16, 2016

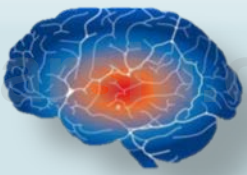


Analyse complémentaire de l'étude MR CLEAN

Figure 2 Modified Rankin Scale (mRS) score at 90 days by intention-to-treat groups



Meilleur pronostic des patients traités par TM sous **sédation** / contrôle
Pas de différence entre patients traités par TM sous **AG** / contrôle



Thrombectomie mécanique (TM)



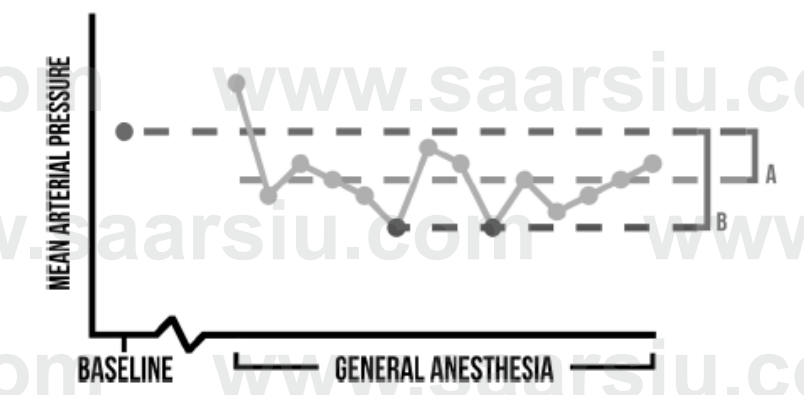
ΔPA

A decrease in blood pressure is associated with unfavorable outcome in patients undergoing thrombectomy under general anesthesia

Treurniet KM, et al. *J. Neurointerventional Surg.* 2018;10:107–111.



Analyse post-hoc
MR CLEAN study



**Baisse de la PA / PA de base
sous AG est associée
à un mauvais devenir**

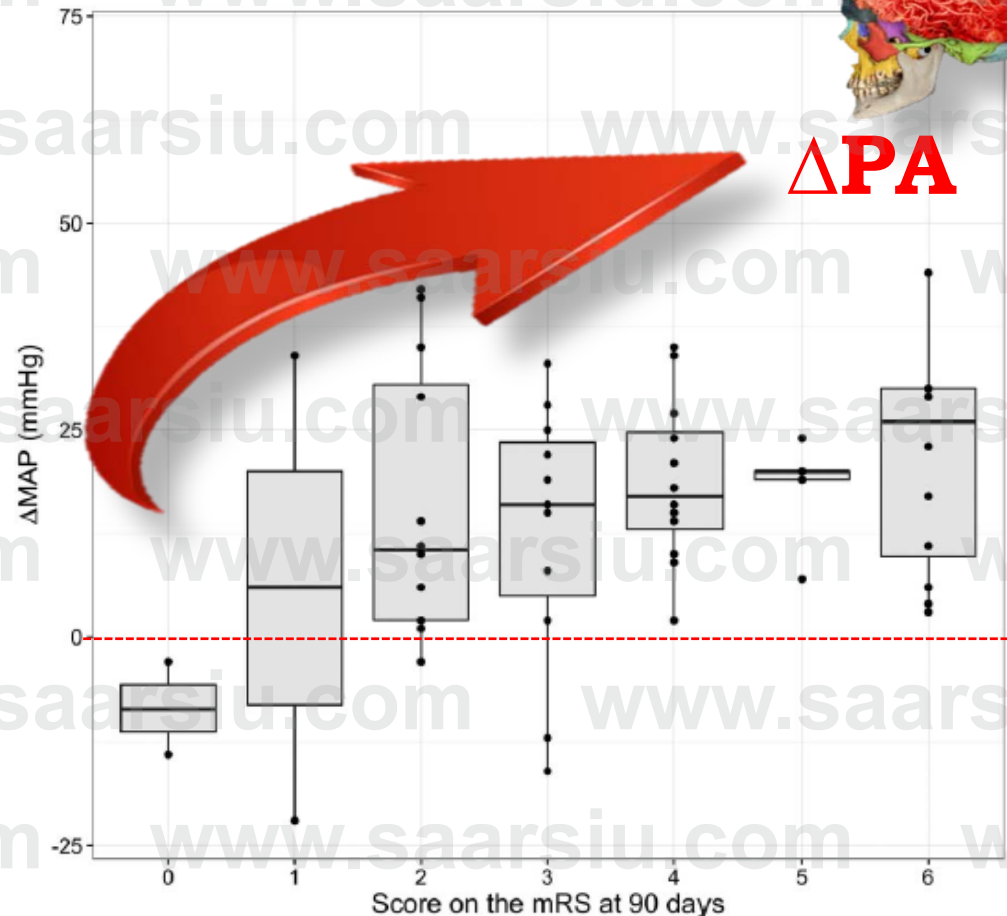
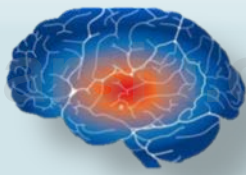


Figure 2 The association of the difference between baseline mean arterial pressure (MAP) and average MAP during GA (ΔMAP) with the score on the modified Rankin Scale (mRS) at 90 days. The dots represent individual patients. The boxes depict the median (black bar) with the IQR.



Thrombectomie mécanique (TM)



JAMA | Original Investigation

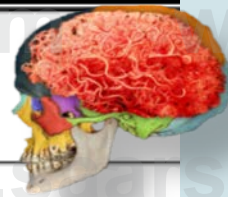
Effect of Conscious Sedation vs General Anesthesia
on Early Neurological Improvement Among Patients With
Ischemic Stroke Undergoing Endovascular Thrombectomy
A Randomized Clinical Trial

Schönenberger S et al. JAMA. 2016;316:1986–1996.

Etude **SIESTA** (Monocentrique)

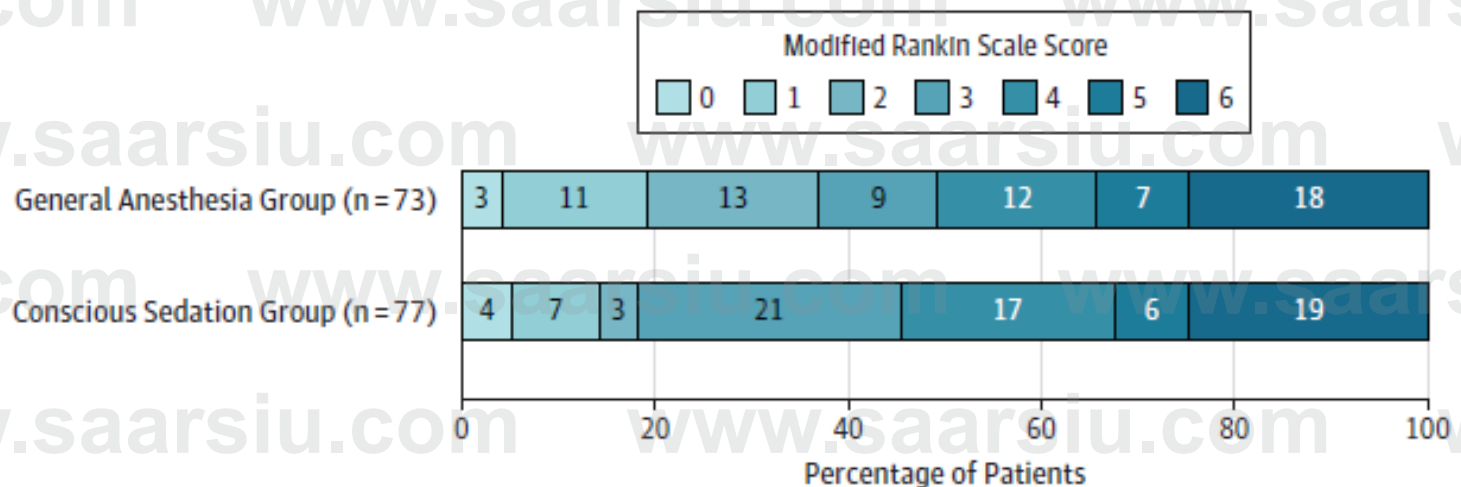
**Absence
de différence significative**

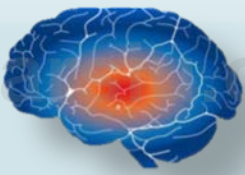
Modified Rankin scale



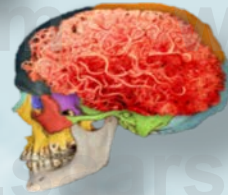
- 0 no symptoms
- 1 no significant disability
- 2 slight disability
- 3 moderate disability
- 4 moderate to severe disability
- 5 severe disability
- 6 dead

Figure 3. Functional Outcome at 90-Day Follow-up in the Intent-to-Treat Population





Thrombectomie mécanique (TM)



Effect of General Anesthesia and Conscious Sedation During Endovascular Therapy on Infarct Growth and Clinical Outcomes in Acute Ischemic Stroke

A Randomized Clinical Trial

Claus Z. Simonsen, MD, PhD¹; Albert J. Yoo, MD, PhD²; Leif H. Sørensen, MD³; [et al](#)

JAMA Neurol. 2018;75(4):470-477. doi:10.1001/jamaneurol.2017.4474

N: 128

Anesthésie générale: **65**

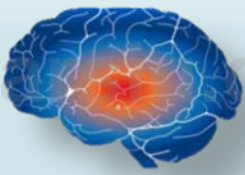
Sédation consciente: **63**

Etude **GOLIATH** (Monocentrique)

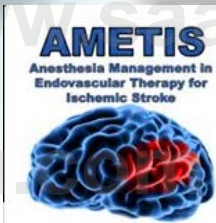
Conclusions and Relevance For patients who underwent thrombectomy for acute ischemic stroke caused by large vessel occlusions in the anterior circulation, GA did not result in worse tissue or clinical outcomes compared with CS.



Absence
de différence significative
*en terme de **volume ischémique***
*ni en terme de **devenir***



Thrombectomie mécanique (TM)



AMETIS

Etude France
Multicentrique
Randomisée
2017 – 2020
N estimé: 270



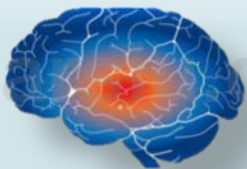
Anesthesia **M**anagement in **E**ndovascular **T**herapy for **I**schemic **S**troke

Evaluation du pronostic neurologique à J7 et J90 → mRS

Morbidité per et post interventionnelle

- 👉 Complication Radiologique: Dissection artériel ou perforation
- 👉 Complication Pulmonaire: Pneumopathie infectieuse
- 👉 Complication Cardio-vasculaire: IDM
- 👉 Complication Neurologique

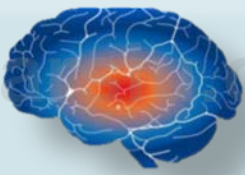




AIT

Quoi de neuf ?





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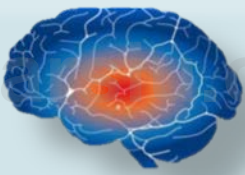
Brutal
Transitoire
Clinique : Territoire vasculaire



Episode neurologique déficitaire de survenue **brutale** dont la cause supposée est une **ischémie focale du cerveau ou de la rétine**, dont les symptômes durent typiquement moins d'une heure et sans signe d'infarctus cérébral à l'imagerie



**Syndrome de menace
du cerveau**



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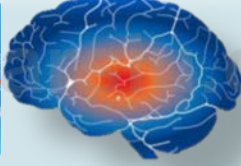
AIT

Brutal
Transitoire
Clinique : Territoire vasculaire



Syndrome de menace du cerveau

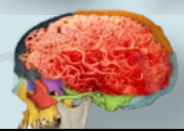
- ➡ **30%** des patient avec infarctus constitué ont eu un AIT
 - ➡ **50%** des infarctus ont lieu dans les 48h après un AIT
 - ➡ Haut risque de RECIDIVE – Faible risque de SAIGNEMENT
 - ➡ Risque d'IC de **10%** à **1 mois**- Diminué à **3%** si PEC rapide
- Intérêt d'agir VITE avant l'accident irréversible**



AVC



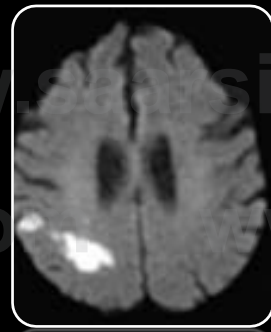
sévérité



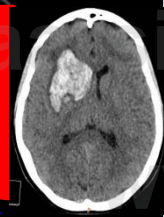
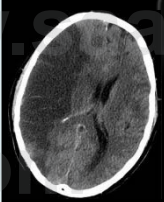
Infarctus cérébral Mineur
NIHSS: 0-5



Infarctus cérébral Modéré
NIHSS: 5-15

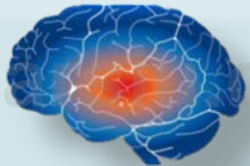


Infarctus cérébral Sévère
NIHSS: >15



Risque hémorragique

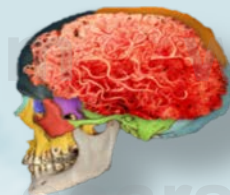
Risque ischémique



AIT

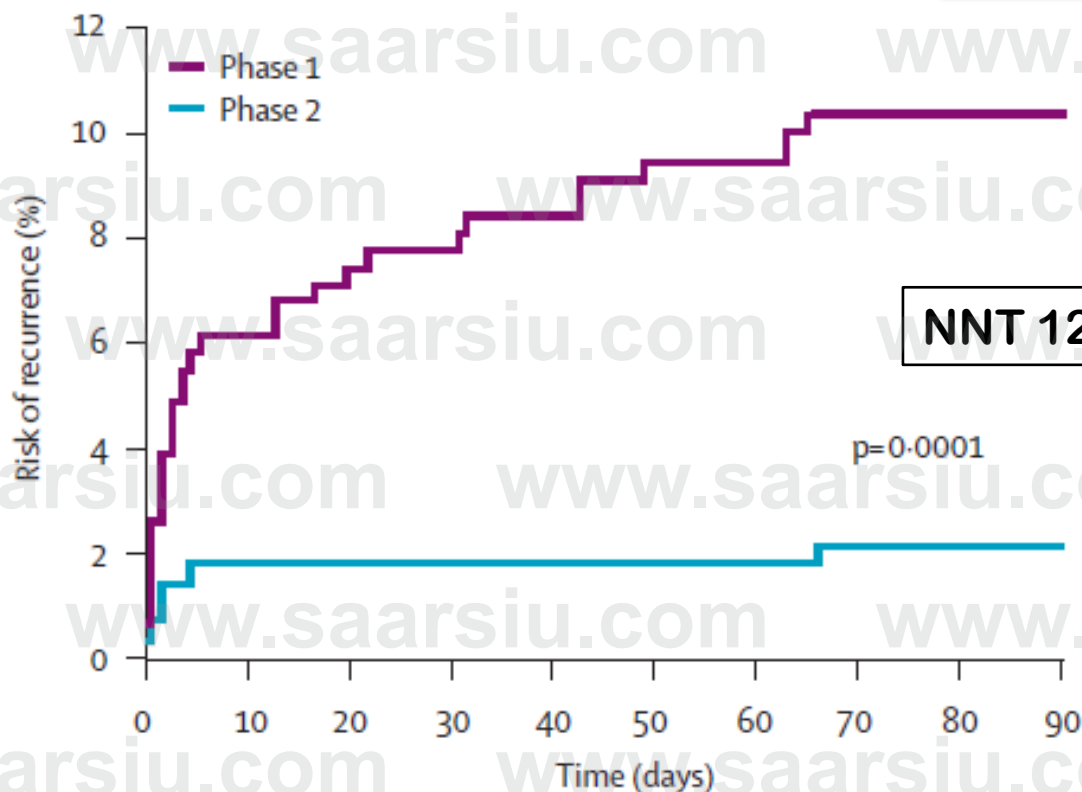
Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison

Peter M Rothwell, Matthew F Giles, Arvind Chandratheva, Lars Marquardt, Olivia Geraghty, Jessica N E Redgrave, Caroline E Lovelock, Lucy E Binney, Linda M Bull, Fiona C Cuthbertson, Sarah J V Welch, Shelley Bosch, Faye Carasco-Alexander, Louise E Silver, Sergei A Gutnikov, Ziyah Mehta, on behalf of the Early use of Existing Preventive Strategies for Stroke (EXPRESS) study



Lancet 2007; 370: 1432-42

Etude EXPRESS

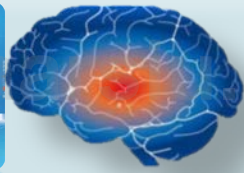


Prise en charge retardée

Prise en charge urgente spécialisée

Réduction
du risque de récurrence
80%

Figure 2: Risk of recurrent stroke after first seeking medical attention in all patients with TIA or stroke who were referred to the study clinic



Facteurs modulant le risque d'AIT ou d'AVC mineur



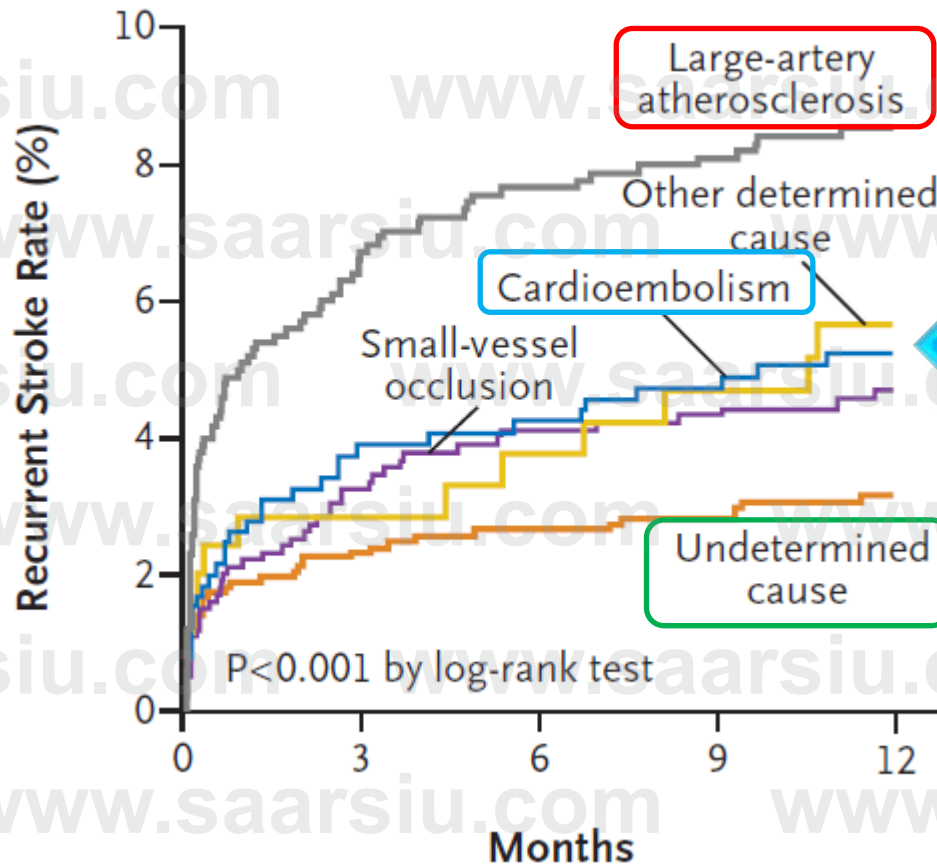
ORIGINAL ARTICLE

One-Year Risk of Stroke after Transient Ischemic Attack or Minor Stroke

Amarencu

N Engl J Med 2016;374:1533-42.

Rate of Recurrent Stroke According to Cause of TIA or Minor Stroke (TOAST Classification)



**Athérosclérose
Des grosses artères**

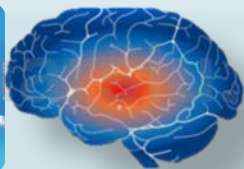
Cardio-embolique

indéterminé

Athérothrombose

4583 Patients

TIAregistry.org



Facteurs modulant le risque d'AIT ou d'AVC mineur

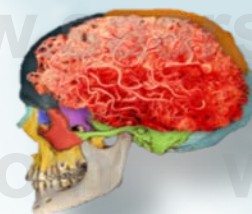


ORIGINAL ARTICLE

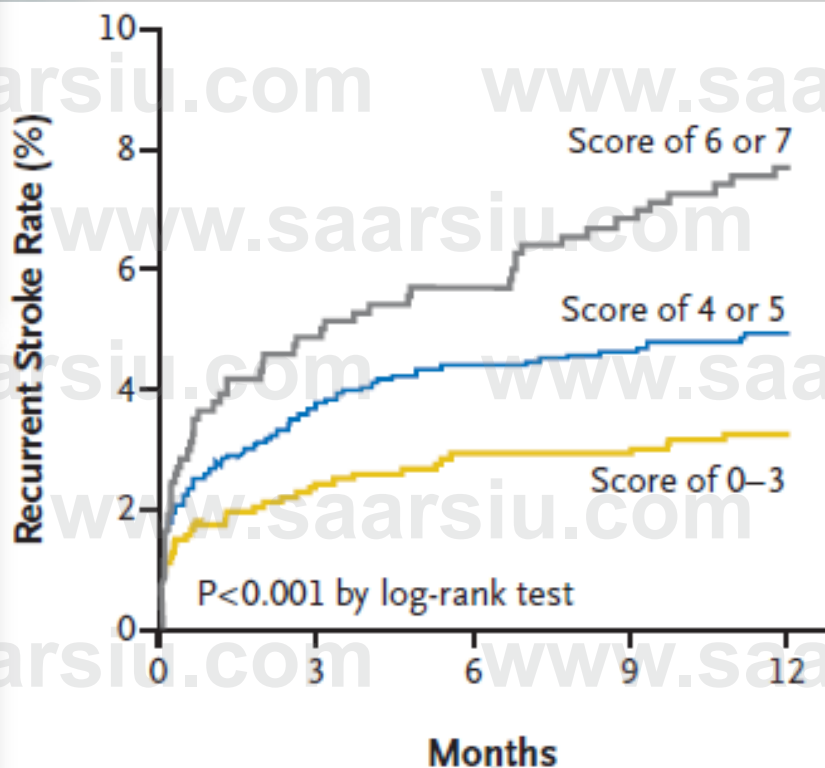
One-Year Risk of Stroke after Transient Ischemic Attack or Minor Stroke

Amarenco

N Engl J Med 2016;374:1533-42.



Rate of Recurrent Stroke According to ABCD² Stroke Risk Score

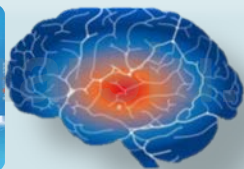


Score ABCD² (risque de survenue d'un AVC constitué après un AIT)

Age	≥ 60 ans	+1
BP (Tension artérielle à l'admission)	≥ 140 / 90 mmHg	+1
Clinique	Faiblesse unilatérale	+2
	Trouble de la parole sans faiblesse	+1
Durée	10 à 59 minutes	+1
	≥ 60 minutes	+2
Diabète	Diabétique	+1

Score ACBD² > 6

Mais 22% récidive avec ACBD² < 4



Facteurs modulant le risque d'AIT ou d'AVC mineur



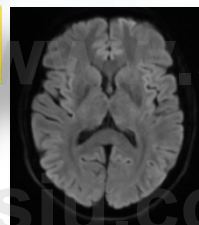
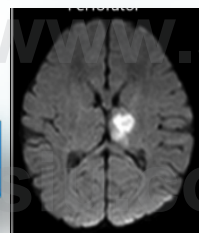
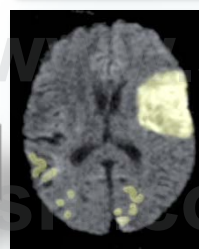
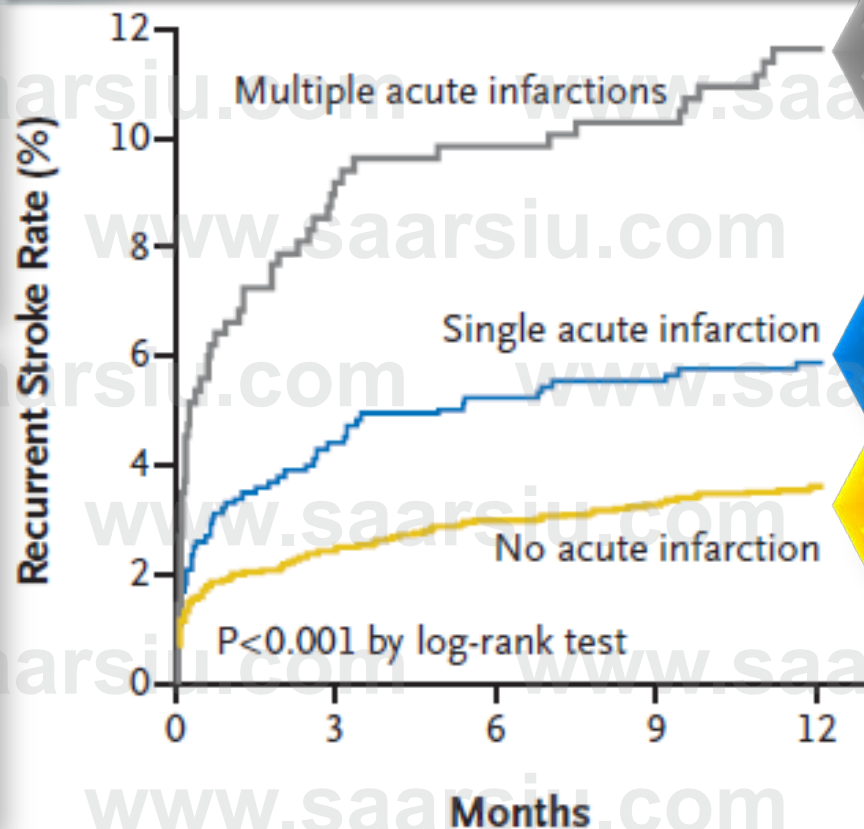
ORIGINAL ARTICLE

One-Year Risk of Stroke after Transient Ischemic Attack or Minor Stroke

Amarenco

N Engl J Med 2016;374:1533-42.

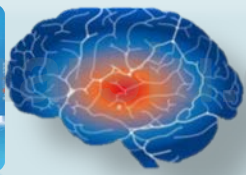
Rate of Recurrent Stroke According to Finding on Brain Imaging



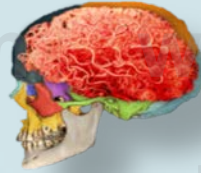
Infarctus multiples

4583 Patients

TIAregistry.org



Facteurs modulant le risque d'AIT ou d'AVC mineur



Amarenco

N Engl J Med 2016;374:1533-42.



ORIGINAL ARTICLE

One-Year Risk of Stroke after Transient Ischemic Attack or Minor Stroke

Facteurs prédictifs multipliant par 2 le risque de récurrence

↓ Clinique:

ABCD²

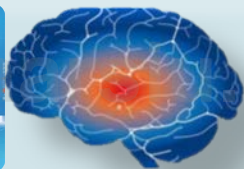
↓ Imagerie (IRM):

Infarctus multiples

↓ Bilan étiologique:

Athérothrombose

22% récurrence avec ABCD² < 4



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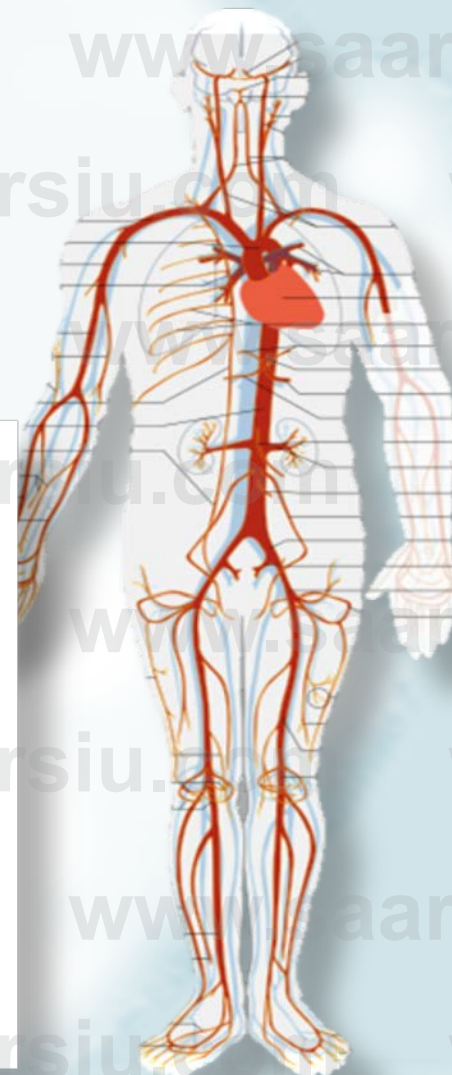


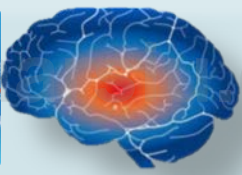
Syndrome de menace du cerveau

Etiologies



- ➡ **Athérosclérose** (athérome): **30 - 40 %**
- ➡ Petites artères cérébrales profondes: **10 -20%**
- ➡ **Causes cardio-emboliques**: **20 – 30%**
- ➡ Causes rares: **5 – 10%**
- ➡ Causes indéterminées: **20 – 30%**





AIT



Syndrome de menace du cerveau

AIT non cardio-embolique

➤ **Double Anti-agrégation plaquettaire 1-3mois**

Etudes: Etudes CHANCE 2013, SOCRATES 2016, POINT 2018, THALES en cours

➤ **Endartériectomie**

Sténose carotidienne (athéromat.) $\geq 50\%$ avec AIT

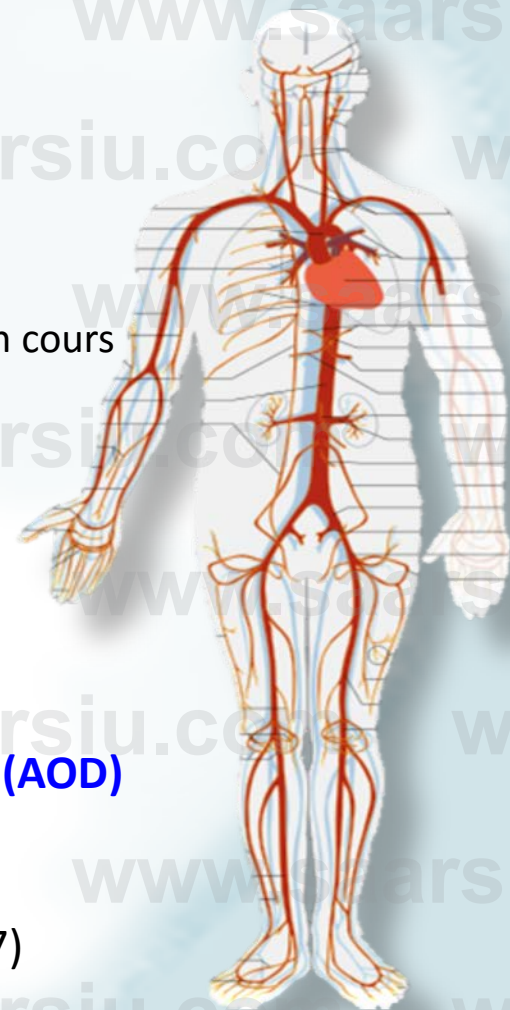
AIT cardio-embolique

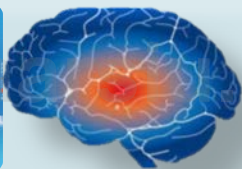
➤ **ACFA non valvulaire:** Anticoagulants oraux directs (AOD)

➤ **ACFA valvulaire:** AVK

➤ **Fermeture FOP** Etudes RESPECT, REDUCE, CLOSE (2017)

➤ **Fermeture auricule gauche**





AVC

Infarctus cérébraux
Accidents ischémiques transitoires
Hémorragies sous-arachnoïdiennes
Hématomes
Thromboses veineuses



Enormément d'Etudes en cours

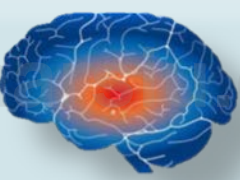
Avancées considérables

Progrès thérapeutiques majeurs

Moyens humains et matériels importants

Peu d'élus aux techniques modernes

Nouvelles recommandations futures.....



MERCI

Stroke Mimic

Présentation typique, qui évoque un AVC mais qui n'en est pas un!

- **Migraine** accompagnée
 - extension progressive, plusieurs territoires artériels
 - céphalée, ATCD migraineux
- **Déficit post-critique**
 - Notion de crise généralisée
 - Terrain (alcoolisme ??)
- **Hypoglycémie** (diabétique traité)
- **Anorganique**
 - souvent évoqué à tort chez le sujet jeune

