

STROKE AND THROMBECTOMY: THE

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 UNIVERSITÉ
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SUD

Bicêtre Hospital
Paris - Sud University School of Medicine

Disclosures

Consultant:

- *Medtronic*
- *Stryker*
- *MicroVention*
- *Balt*

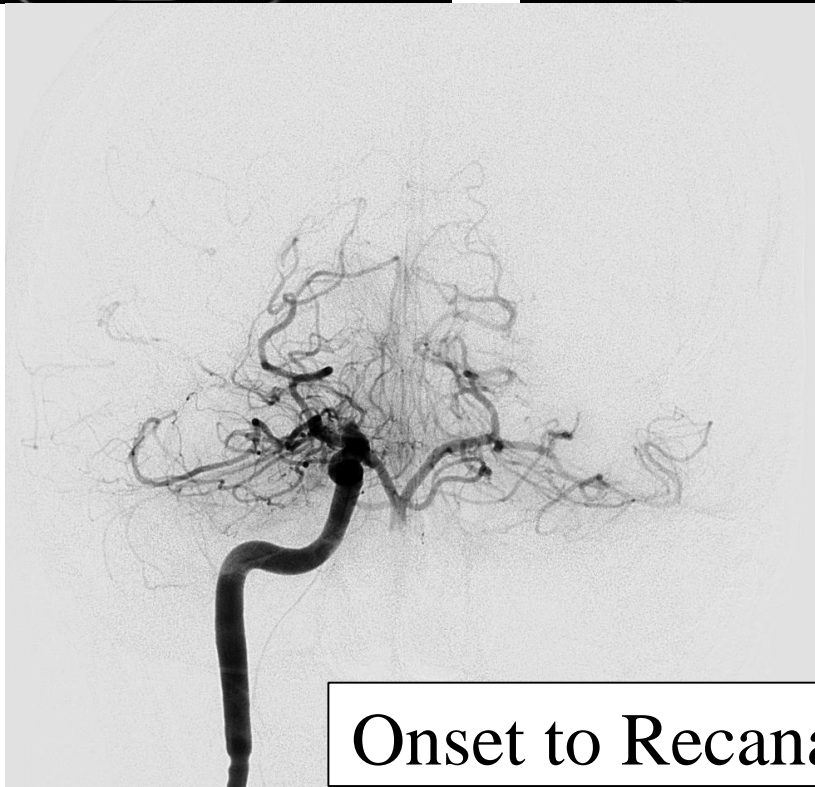
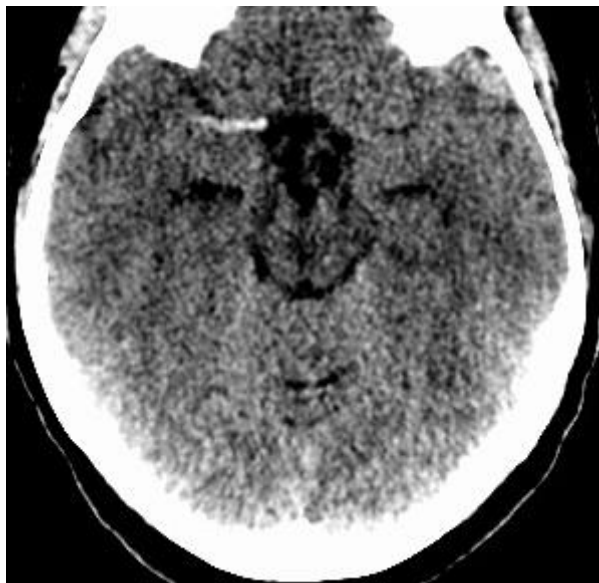
Hospital research grant:

- *Philips*

Permanent balance between ischemia and bleeding

« The neurologist is anxious... but the brain is fragile »

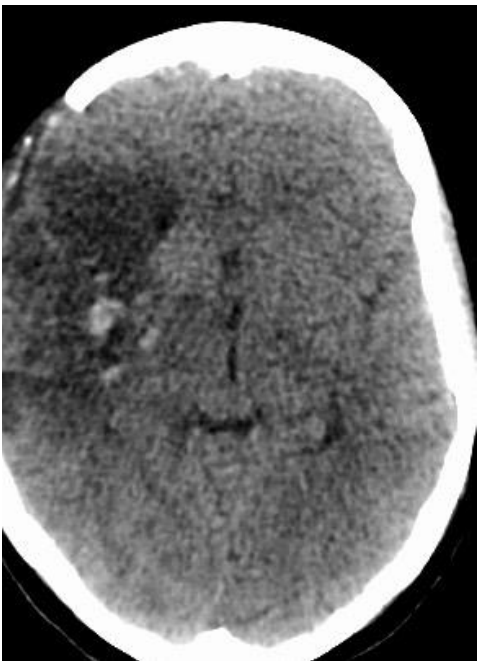
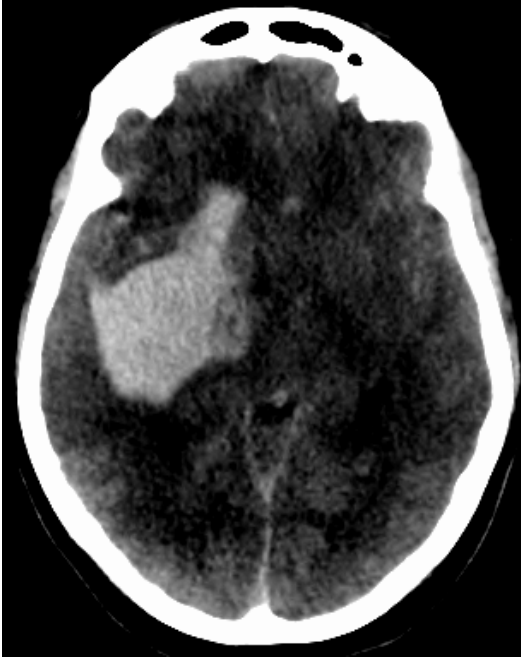




Onset to Recanalization 5h



Few hours later



Discharge mRs 4



First step: Creation of stroke Centers !

Hankey and Warlow (*Lancet 1999*)

Patient Care in Stroke centers

=> Reduce death/dependency from 62% to 56.4%

**NEED TO TREAT
18 PATIENTS TO SAVE ONE**



Second step: IV thrombolysis

1996

- ECASS 1
- ECASS 2
- NINDS
- ATLANTIS A
- ATLANTIS B
- MAST
- Australian Streptokinase Trial
- Lot of secondary analysis and meta-analysis..
- ECASS 3
- And today still ongoing trials

Today

What is the efficacy of IV Thrombolysis ?

0-3 H: Utility clearly demonstrated

NTT to prevent 1 death or disability: 7

3 to 4.5 H: Demonstrated by ECASS III

NTT to prevent 1 death or disability: 14

Third Step: the development of the Endovascular treatment of acute Stroke

Thrombectomy: Non dedicated tools!

Could we find something on the shelves
that could work to reopen an artery ?

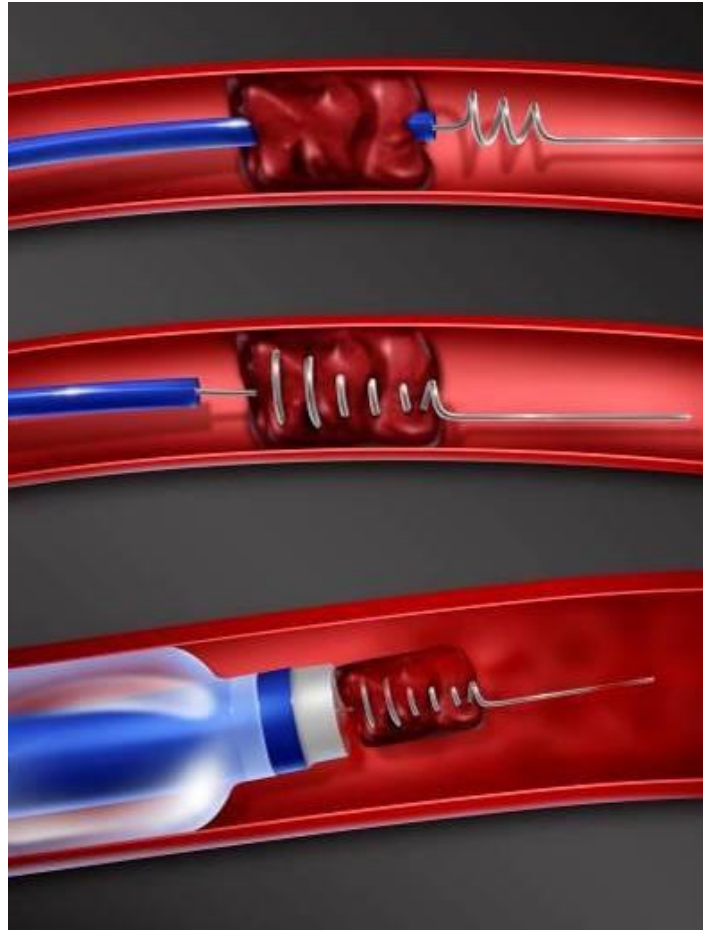
SnARES



Baskets

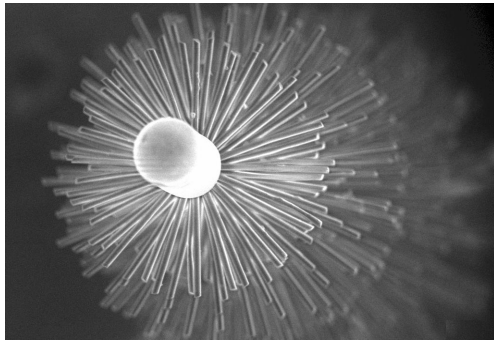


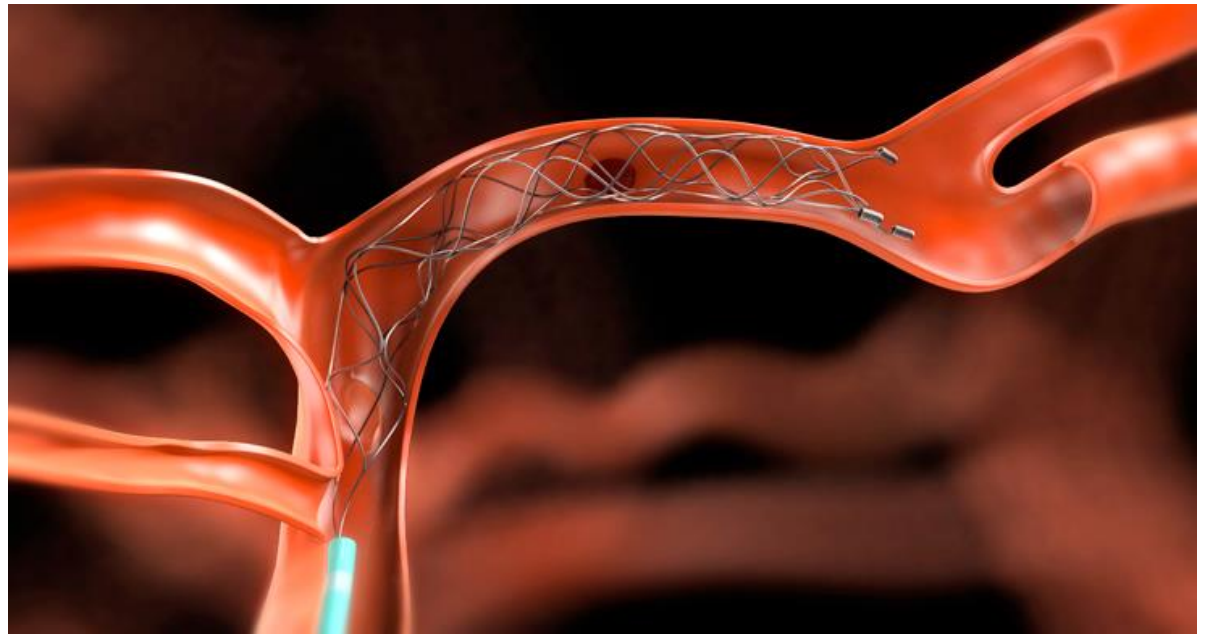
The Merci System



A superb Video which have convinced neurologists !

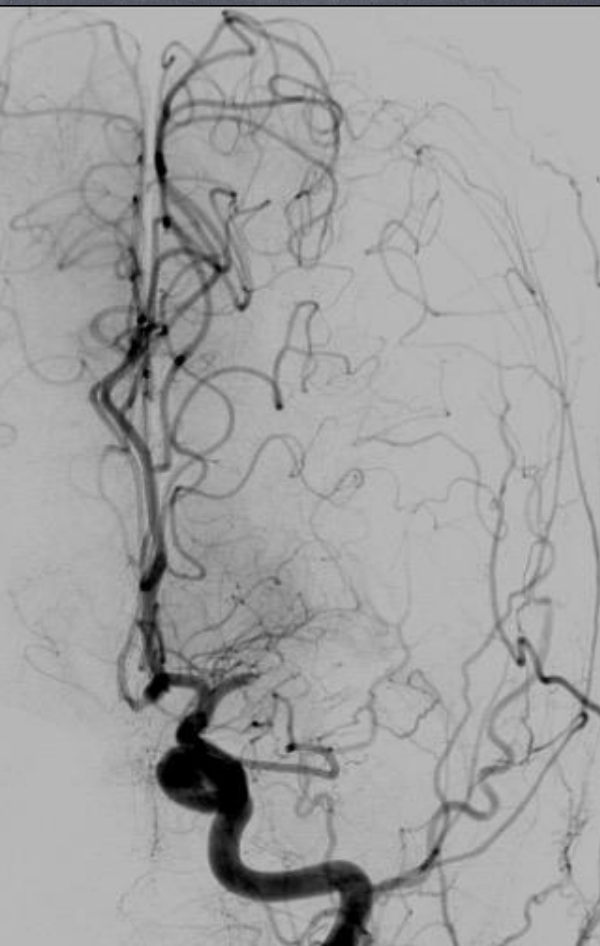
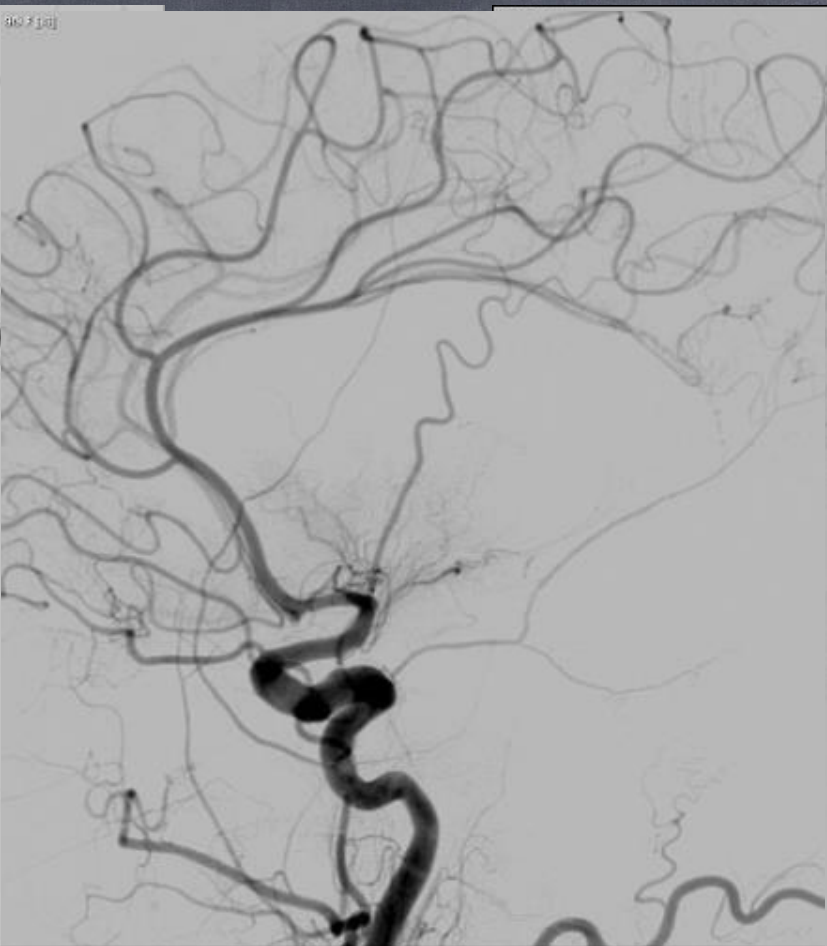
Phenox Clot retriever











Rot -1°
Ang -15°
FD 19 cm

S29

Plan 6

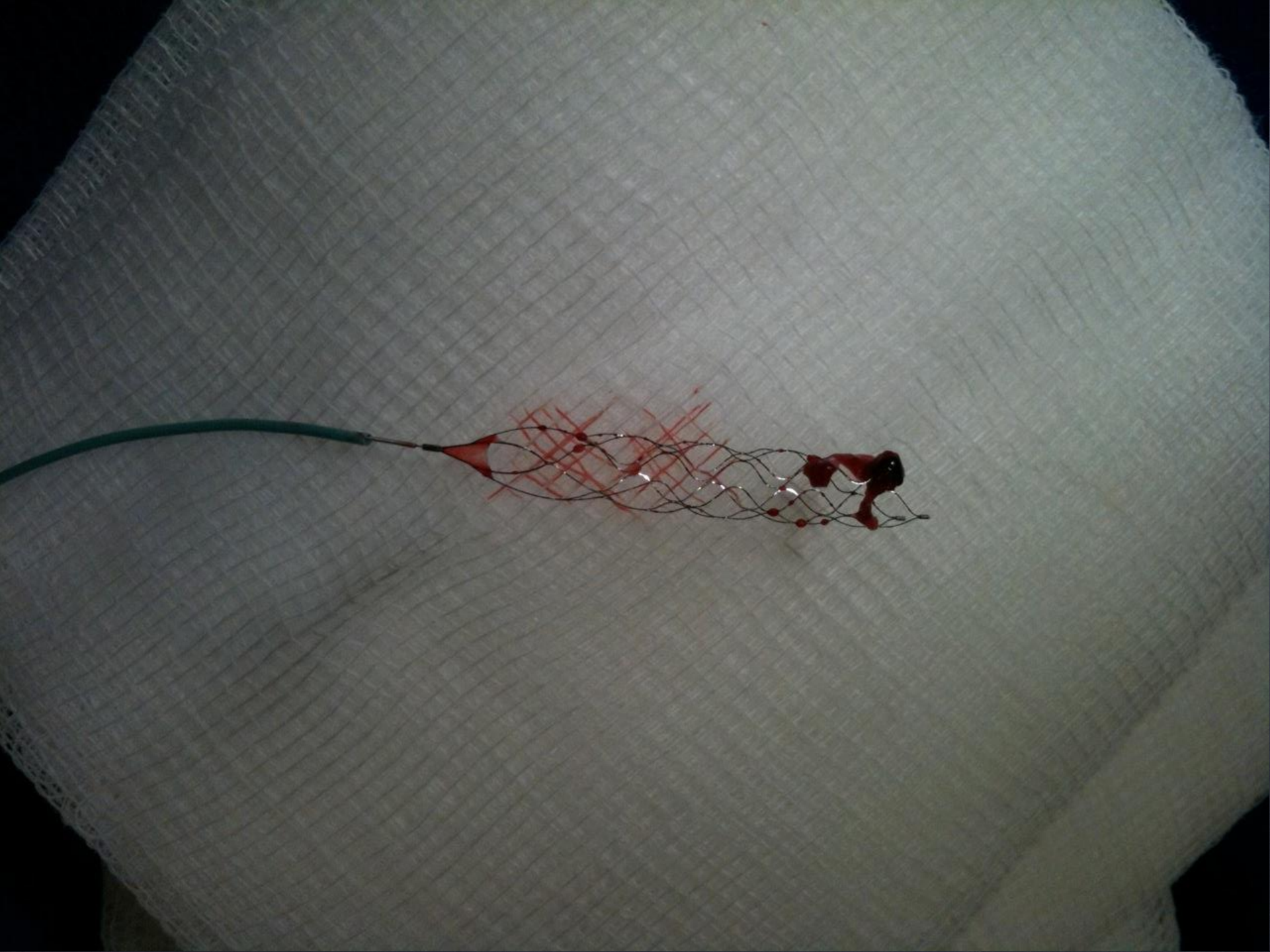


0:40
0:33
12:32:40

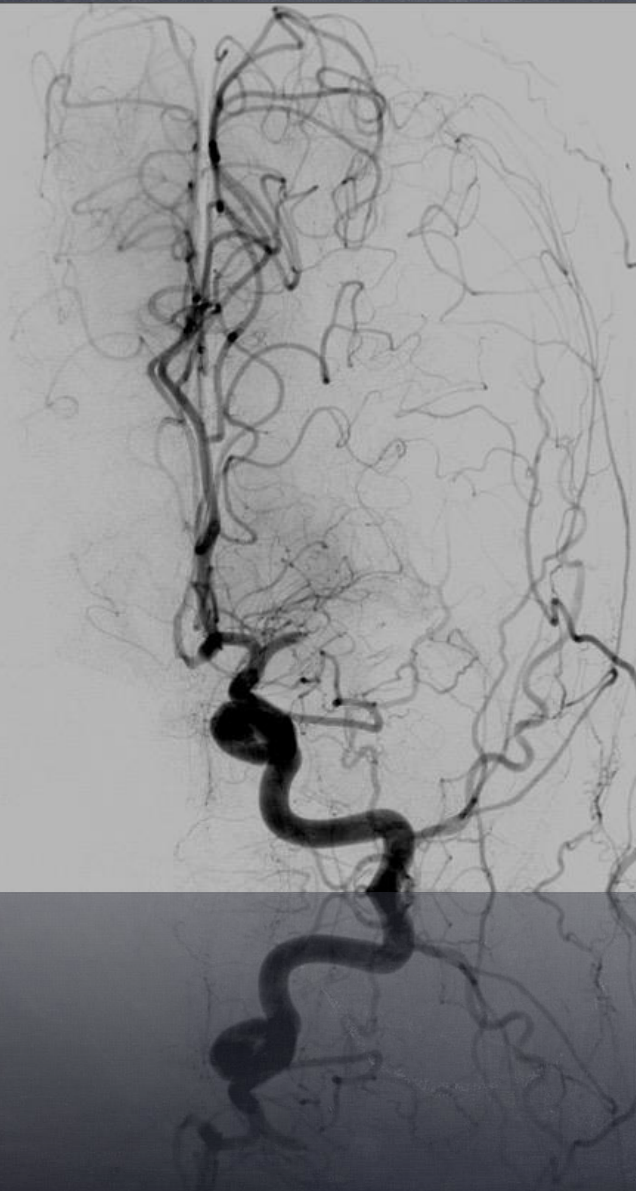
29
7-6

15:08:30
0:33
0:40

1-e
38



01/02/2011



01/02/2011



The enthusiasm of Neuroradiologist/Neurologist was so high that for a while doing randomized studies to show evidence that Thrombectomy is better than IV was not considered !

The reasons advocated were:
« It works so well that I can't randomize »
"It is not ethical »



9th World Stroke Congress

22-25 October 2014 | Istanbul, Turkey



LET ME CLEAN YOUR PIPES

STROKE



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, P.J. Nederkoorn, M.J.H. Wermer, M.A.A. van Walderveen, J. Staals, J. Hofmeijer, J.A. van Oostayen, G.J. Lycklama à Nijeholt, J. Boiten, P.A. Brouwer, B.J. Emmer, S.F. de Bruijn, L.C. van Dijk, L.J. Kappelle, R.H. Lo, E.J. van Dijk, J. de Vries, P.L.M. de Kort, W.J.J. van Rooij, J.S.P. van den Berg, B.A.A.M. van Hasselt, L.A.M. Aerden, R.J. Dallinga, M.C. Visser, J.C.J. Bot, P.C. Vroomen, O. Eshghi, T.H.C.M.L. Schreuder, R.J.J. Heijboer, K. Keizer, A.V. Tielbeek, H.M. den Hertog, D.G. Gerrits, R.M. van den Berg-Vos, G.B. Karas, E.W. Steyerberg, H.Z. Flach, H.A. Marquering, M.E.S. Sprengers, S.F.M. Jenniskens, L.F.M. Beenen, R. van den Berg, P.J. Koudstaal, W.H. van Zwam, Y.B.W.E.M. Roos, A. van der Lugt, R.J. van Oostenbrugge, C.B.L.M. Majoie, and D.W.J. Dippel, for the MR CLEAN Investigators*

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Randomized Assessment of Rapid Endovascular Treatment of Ischemic Stroke

M. Goyal, A.M. Demchuk, B.K. Menon, M. Eesa, J.L. Rempel, J. Thornton, D. Roy, T.G. Jovin, R.A. Willinsky, B.L. Sapkota, D. Dowlatshahi, D.F. Frei, N.R. Kamal, W.J. Montanera, A.Y. Poppe, K.J. Ryckborst, F.L. Silver, A. Shuaib, D. Tampieri, D. Williams, O.Y. Bang, B.W. Baxter, P.A. Burns, H. Choe, J.-H. Heo, C.A. Holmstedt, B. Jankowitz, M. Kelly, G. Linares, J.L. Mandzia, J. Shankar, S.-I. Sohn, R.H. Swartz, P.A. Barber, S.B. Coutts, E.E. Smith, W.F. Morrish, A. Weill, S. Subramaniam, A.P. Mitha, J.H. Wong, M.W. Lowerison, T.T. Sajobi, and M.D. Hill for the ESCAPE Trial Investigators*

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Endovascular Therapy for Ischemic Stroke with Perfusion-Imaging Selection

B.C.V. Campbell, P.J. Mitchell, T.J. Kleinig, H.M. Dewey, L. Churilov, N. Yassi, B. Yan, R.J. Dowling, M.W. Parsons, T.J. Oxley, T.Y. Wu, M. Brooks, M.A. Simpson, F. Miteff, C.R. Levi, M. Krause, T.J. Harrington, K.C. Faulder, B.S. Steinfurt, M. Priglinger, T. Ang, R. Scroop, P.A. Barber, B. McGuinness, T. Wijeratne, T.G. Phan, W. Chong, R.V. Chandra, C.F. Bladin, M. Badve, H. Rice, L. de Villiers, H. Ma, P.M. Desmond, G.A. Donnan, and S.M. Davis, for the EXTEND-IA Investigators*

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

JUNE 11, 2015

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

Jeffrey L. Saver, M.D., Mayank Goyal, M.D., Alain Bonafé, 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*

ORIGINAL ARTICLE

Thrombectomy within 8 Hours after Symptom Onset in Ischemic Stroke

T.G. Jovin, A. Chamorro, E. Cobo, M.A. de Miquel, C.A. Molina, A. Rovira, L. San Román, J. Serena, S. Abilleira, M. Ribó, M. Millán, X. Urra, P. Cardona, E. López-Cancio, A. Tomasello, C. Castañó, J. Blasco, L. Aja, L. Dorado, H. Quesada, M. Rubiera, M. Hernández-Pérez, M. Goyal, A.M. Demchuk, R. von Kummer, M. Gallofré, and A. Dávalos, for the REVASCAT Trial Investigators*

Modified Rankin Score at 90 days

- 0: No symptoms
- 1: No clinically significant disability
- 2: Slight disability
(able to handle own affairs without assistance but unable to carry out all previous activities)
- 3: Moderate disability requiring some help
(e.g., with shopping, cleaning, and finances but able to walk un-assisted)
- 4: Moderately severe disability
(unable to attend to bodily needs without assistance and unable to walk unassisted)
- 5: Severe disability
(requiring constant nursing care and attention)
- 6: death

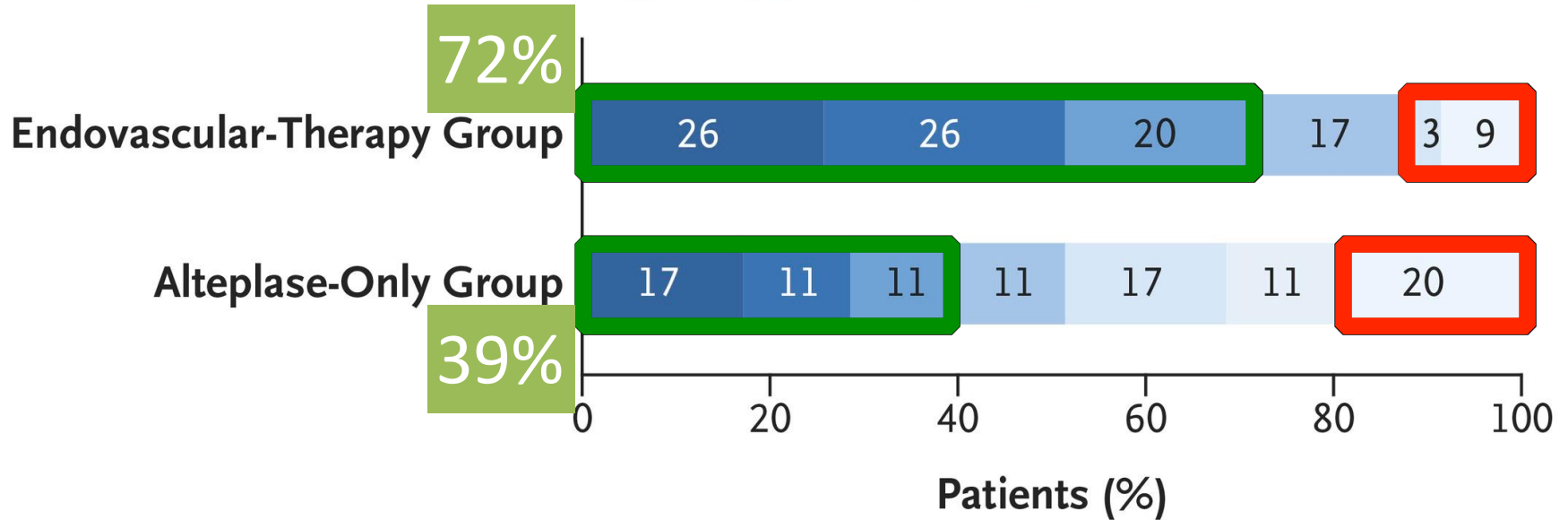
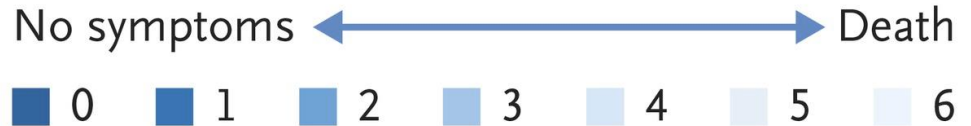
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Extend-IA

Scores on the Modified Rankin Scale at 90 Days in the Intention-to-Treat Population

Score on Modified Rankin Scale



Need To Treat, to prevent 1 death or disability

	<i>Need to treat</i>
<i>Stroke center</i>	18
<i>IV<3h</i>	7
<i>3h< IV <4.5h</i>	14

40 - 50% of patients do not reach a stroke center

Only 10 - 15% of patients receive IV thrombolysis

<i>Thombectomy</i>	<i>Need to treat</i>
<i>MR CLEAN</i>	7.4
<i>ESCAPE</i>	4
<i>EXTEND IA</i>	3.2

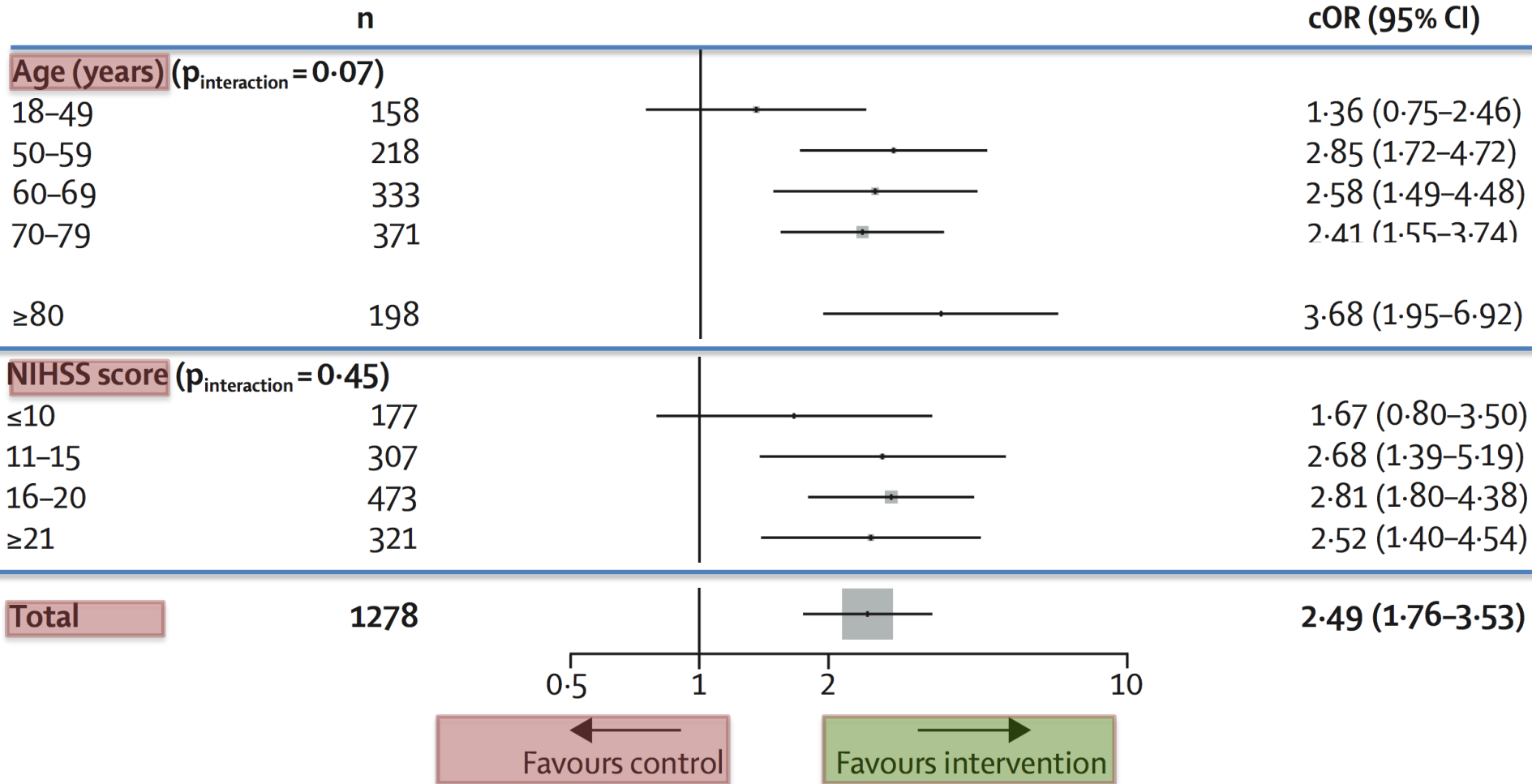
Efficacy of Endovascular Treatment

MI vs Stroke

	<i>Treatment</i>	<i>Endpoint</i>
<i>STEMI</i>	<i>PTA vs Thrombolysis (1)</i>	<i>Mortality</i>
<i>STROKE</i>	<i>MT vs Thrombolysis</i>	<i>Independence</i>

(1) Keeley EC et al. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. Lancet. 2003;361:13-20.

Pre-specified subgroups



Benefit:

- Even for age >80yo
- Whatever the initial clinical severity



Consensus



Mechanical thrombectomy in acute ischemic stroke: Consensus statement by ESO-Karolinska Stroke Update 2014/2015, supported by ESO, ESMINT, ESNR and EAN

Nils Wahlgren^{1,2}, Tiago Moreira^{1,2}, Patrik Michel³, Thorsten Steiner^{4,5}, Olav Jansen⁶, Christophe Cognard⁷, Heinrich P Mattle^{8,9}, Wim van Zwam¹⁰, Staffan Holmin^{1,11}, Turgut Tatlisumak^{12,13,14}, Jesper Petersson^{15,16}, Valeria Caso¹⁷, Werner Hacke⁴, Mikael Mazighi¹⁸, Marcel Arnold^{8,9}, Urs Fischer^{8,9}, Istvan Szikora¹⁹, Laurent Pierot²⁰, Jens Fiehler²¹, Jan Gralla²², Franz Fazekas²³; Kennedy R Lees^{24,25} for ESO-KSU, ESO, ESMINT, ESNR and EAN

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European Consensus Statement on Thrombectomy (Accepted for publication in *International Journal of Stroke*)

Thrombectomy is recommended for **LVO Stroke**
of the anterior circulation in addition to IV up to
6h after onset



European Consensus Statement on Thrombectomy (Accepted for publication in *International Journal of Stroke*)

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of the anterior circulation in addition to IV up to
6h after onset

From guidelines
To real life
And daily practice

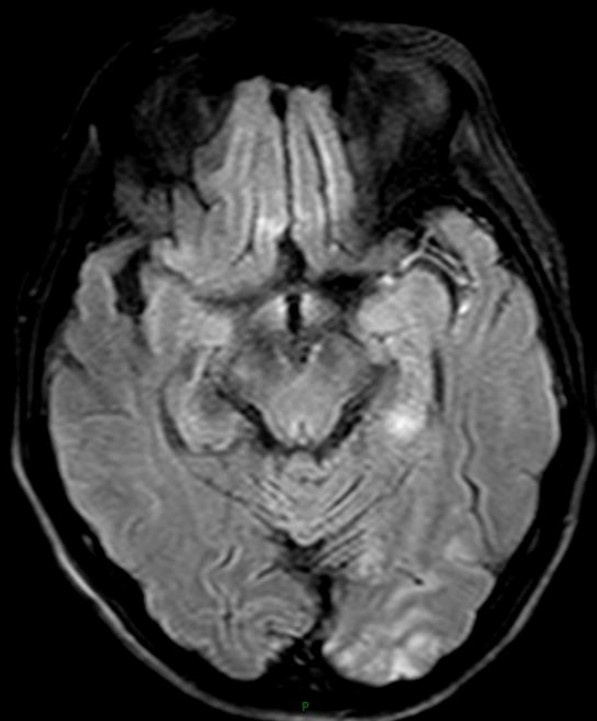
What means “up to 6h after onset” ?
Angio-room ?
Groin?
Recanalization ?

From guidelines
To real life
And daily practice

When to decide it is too late
to transfer the patient to the angiosuite?

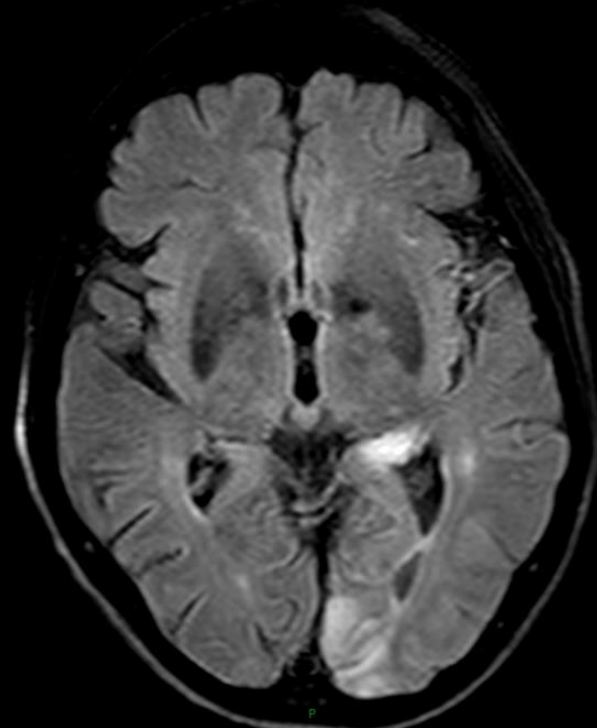
Late time
but
Good collaterals
= Good Outcome

« SLOW PROGRESSORS »

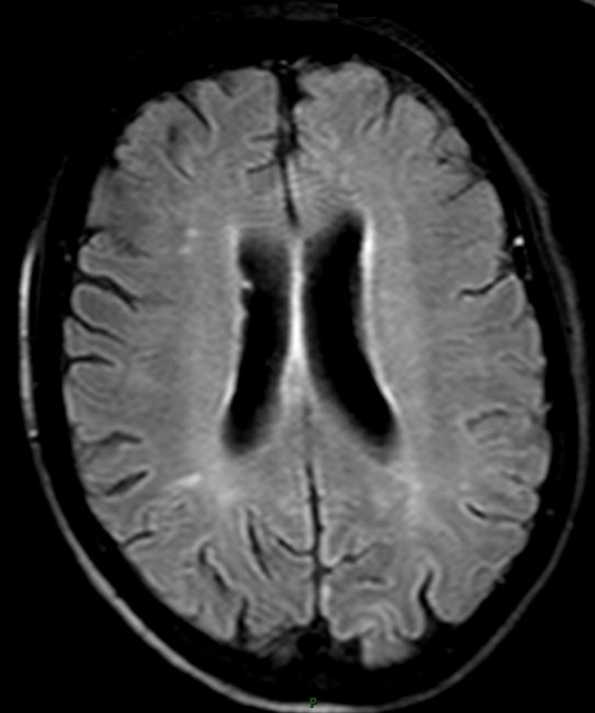
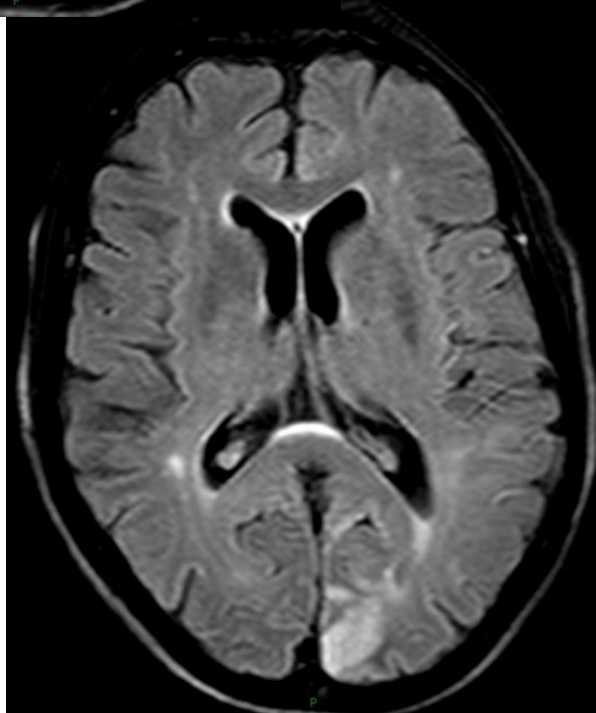


MRI - H+1

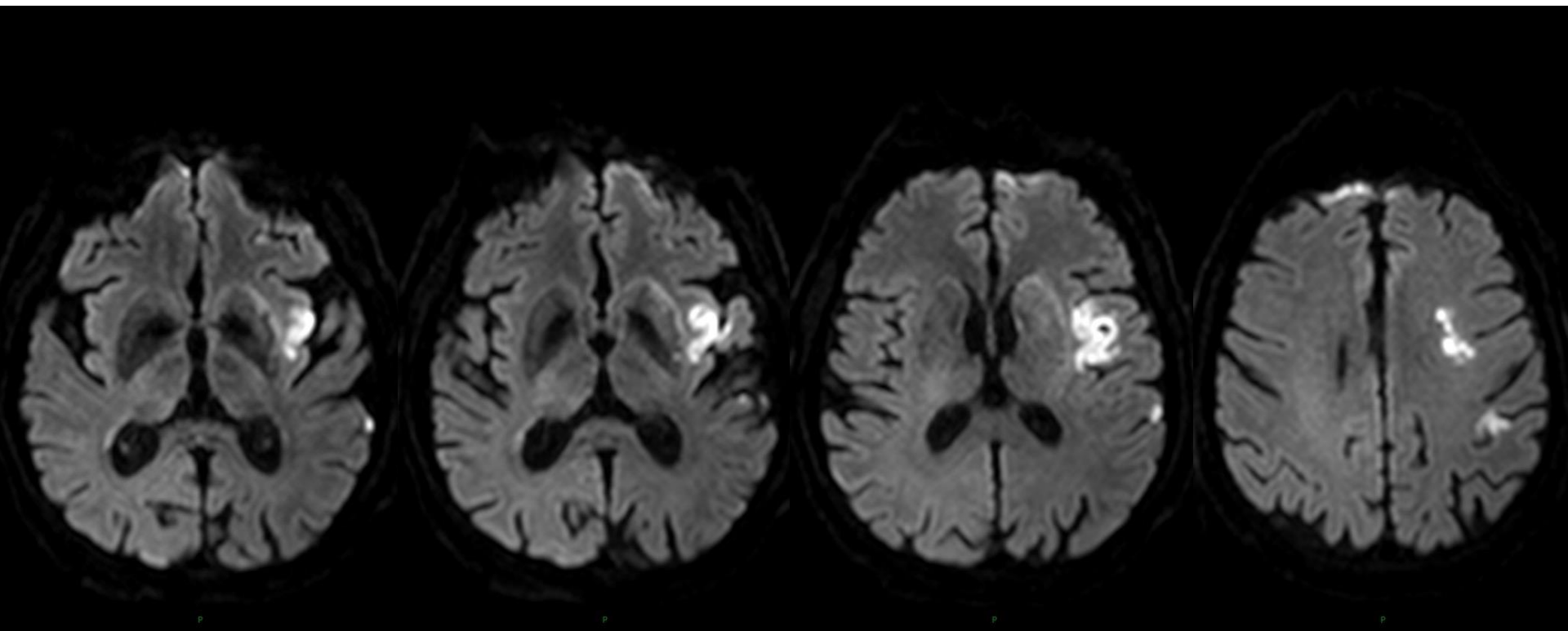
Slow flow



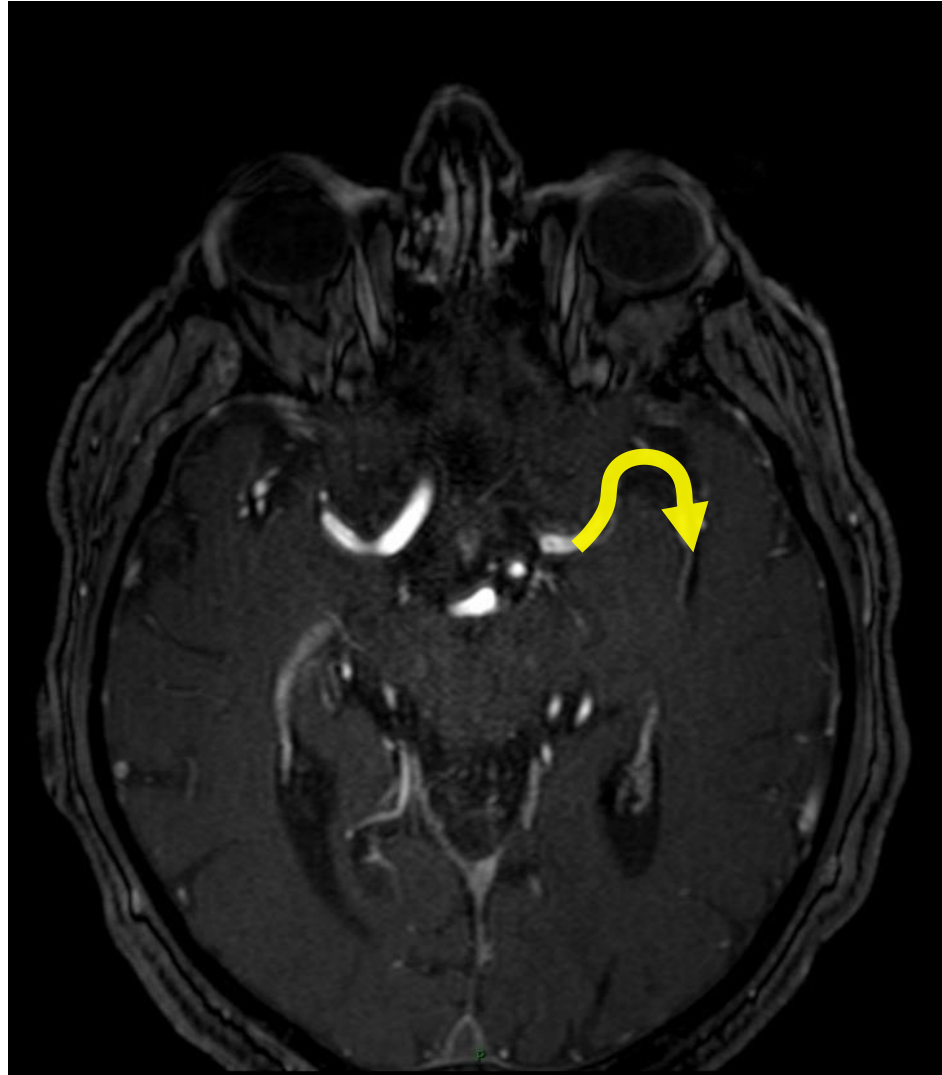
FLAIR



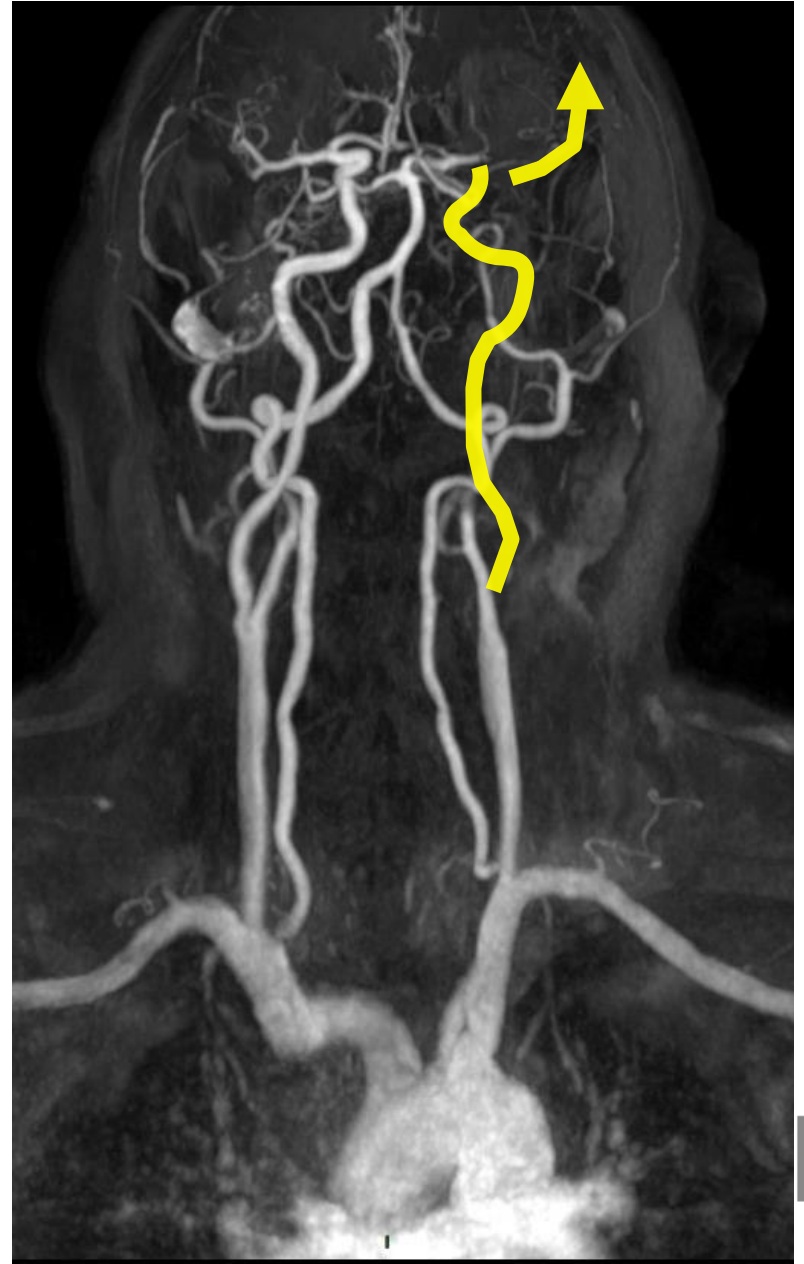
DWI MRI



M1 occlusion



ICA occlusion



Right ICA - AP



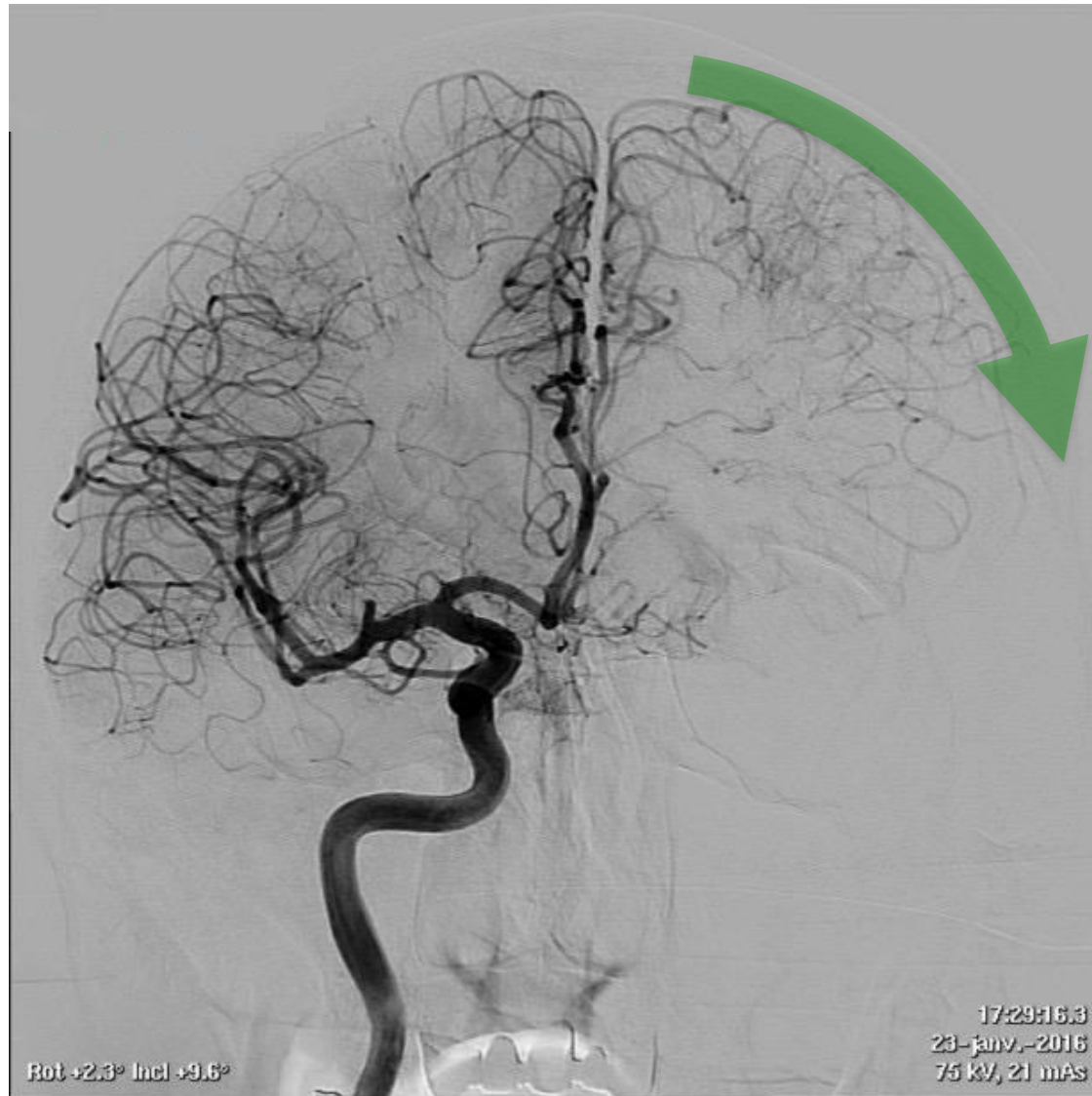
Right ICA - AP



Right ICA - AP



Right ICA - AP



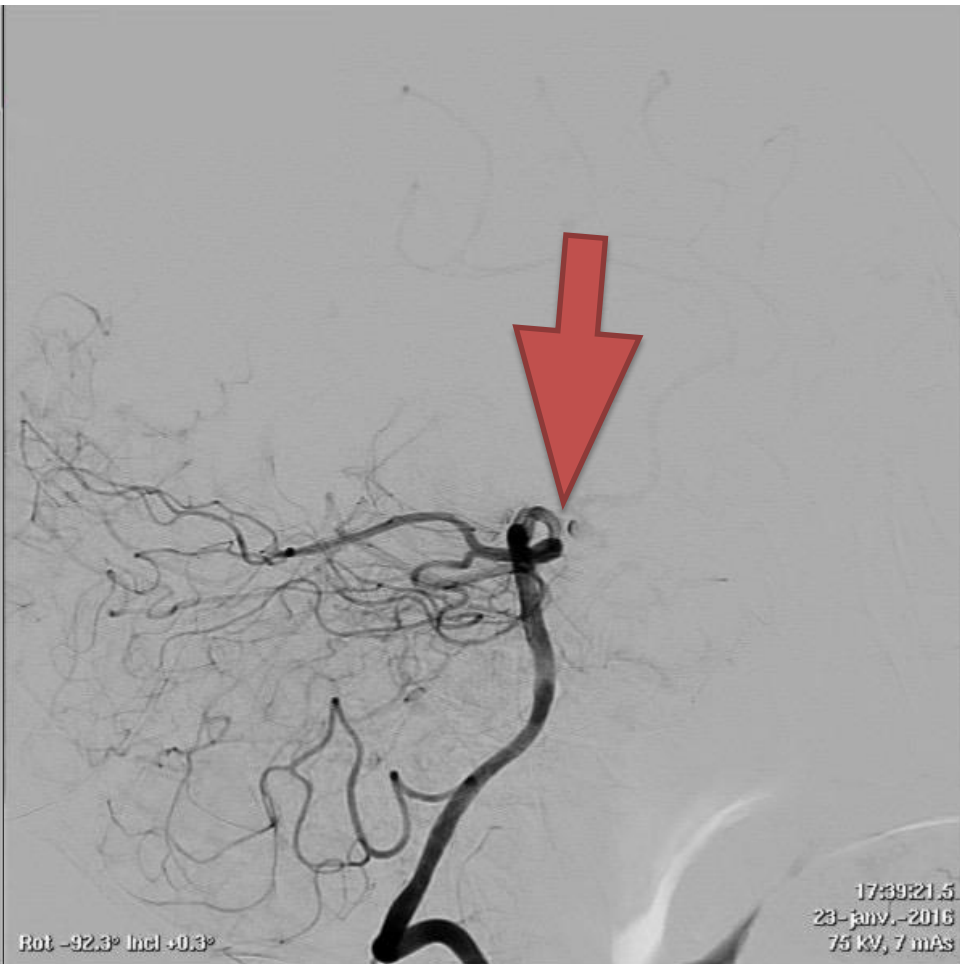
Right ICA - AP



Left VA

AP

Lat



Left VA

AP

Lat



AP

Left VA

Right ICA



Early time
but
Poor collaterals
= Poor Outcome

« FAST PROGRESSORS »

Is thrombectomy useful after 6 h,
up to 24 hours after symptom onset?

Dawn study stopped!!!

- To identify brain at risk for ischemia yet still potentially salvageable
 - Patients with severe stroke (NIHSS)
 - But small lesion on diffusion

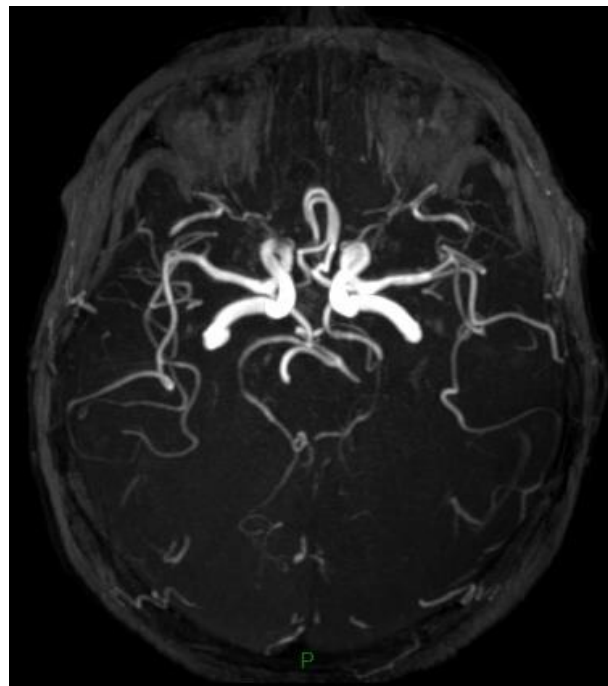
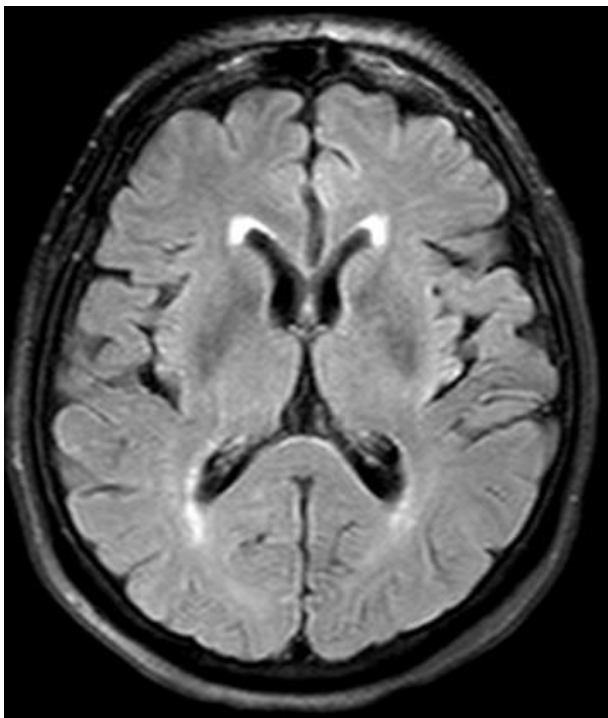
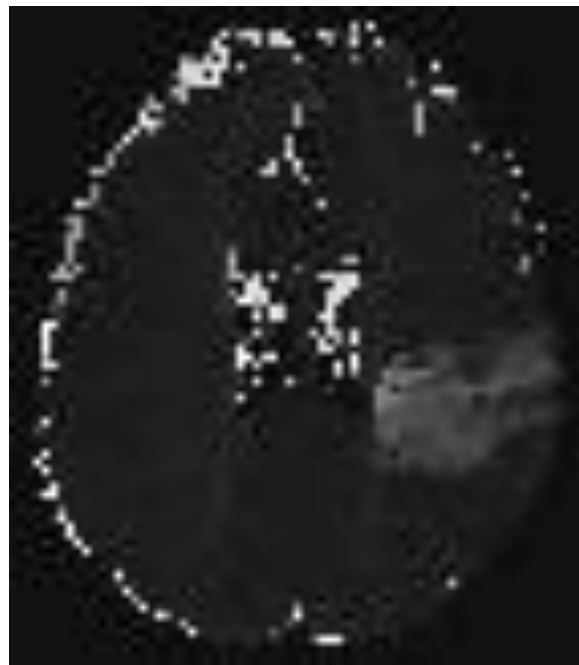
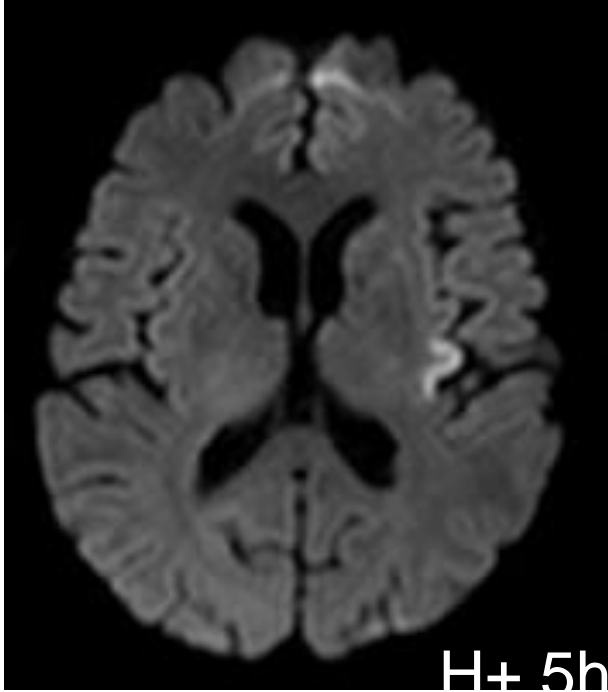
NTT: 2.8!!!

Acute knowledge of anatomy of the brain arteries

78 yo female

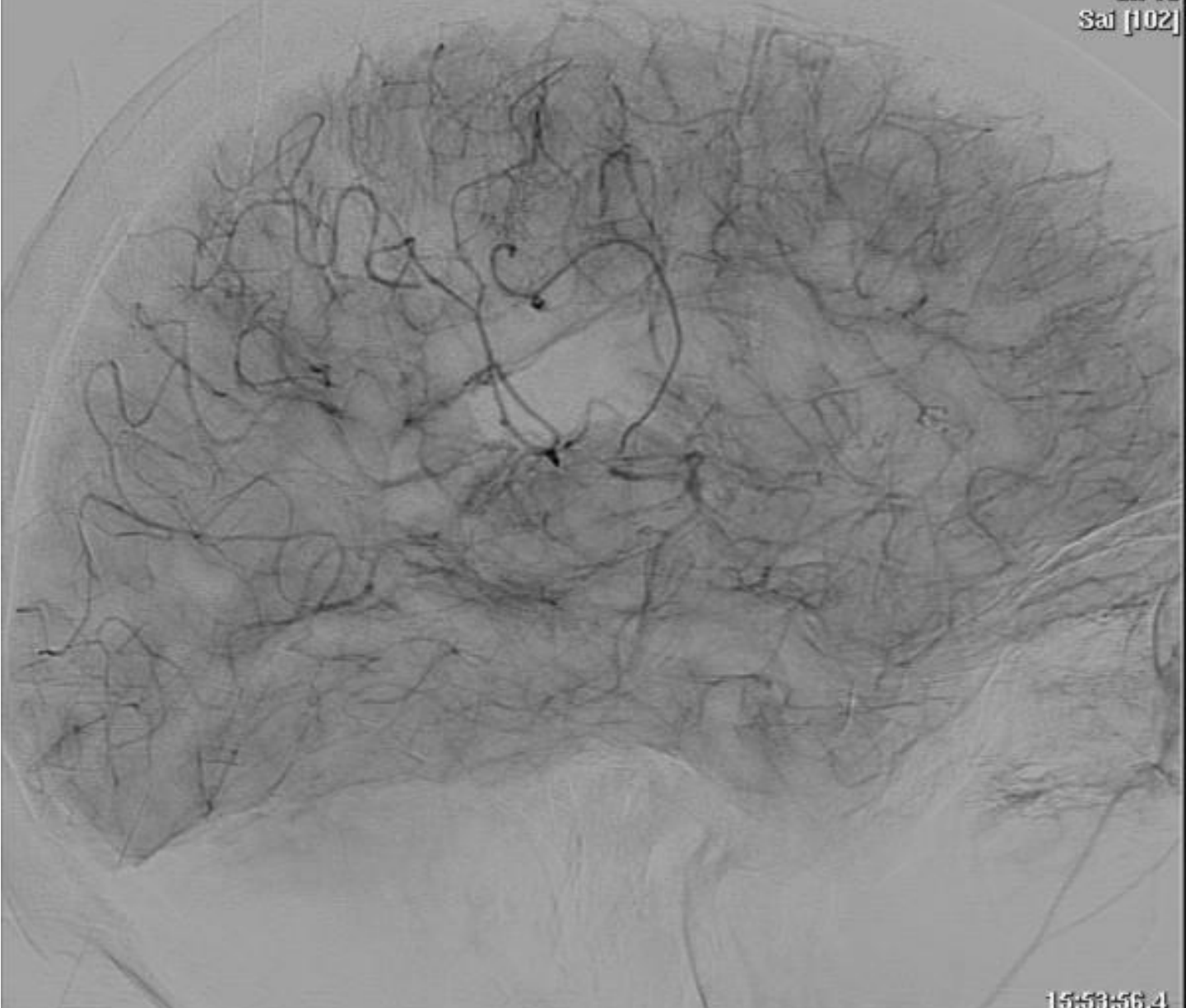
- Aphasia +++++
- Right hemiparesis - right hemianesthesia
- Ataxia

- NIHSS score = 10



<28.15.15 (TOUT)>
THERIACE, ALPHE JOSE
3/12-22 L [22]

05-mars-2016
15:53:56
Im 15
Sai [102]



Rot -90.7° Incl +0.0°

15:53:56.4
05-mars-2016
75 KV, 8 mAs

NEURI
BICÊTRE

<28,14,14 (TOMÉ)>
T. B. ROSE, T. ANNE ROSE
3/10-22 L [22]

05-mars-2016
15:53:56
Im 14
Sai [102]



Rot -90.7° Incl +0.0°

15:53:56.4
05-mars-2016
75 kV, 8 mAs

NEURI
BICÊTRE

16:20:46 (TOM) >
TUBOCL. MARIE JOSE
1073 L [3]

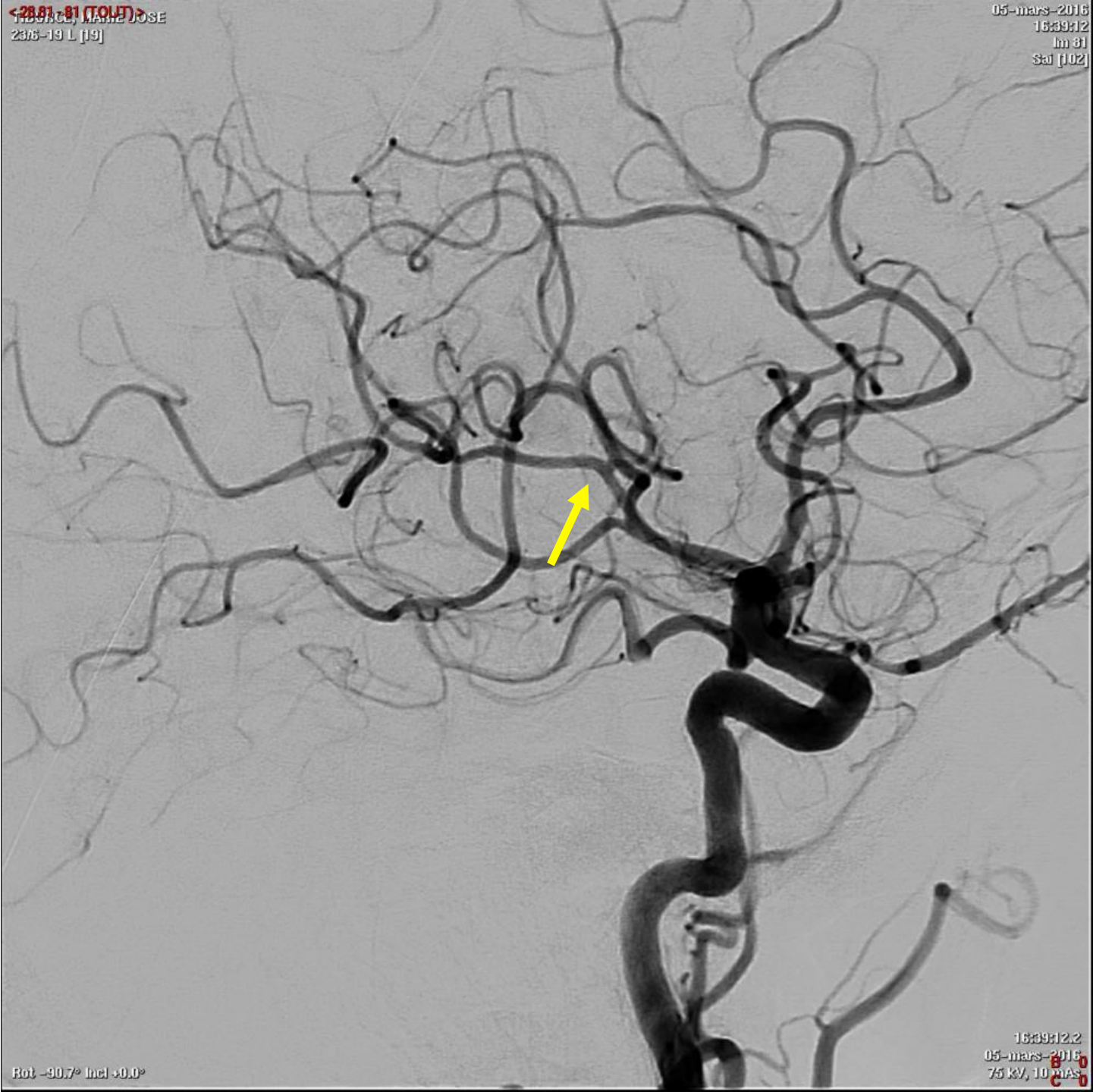
05-mars-2016
16:20:08
Im 46
Sai [102]

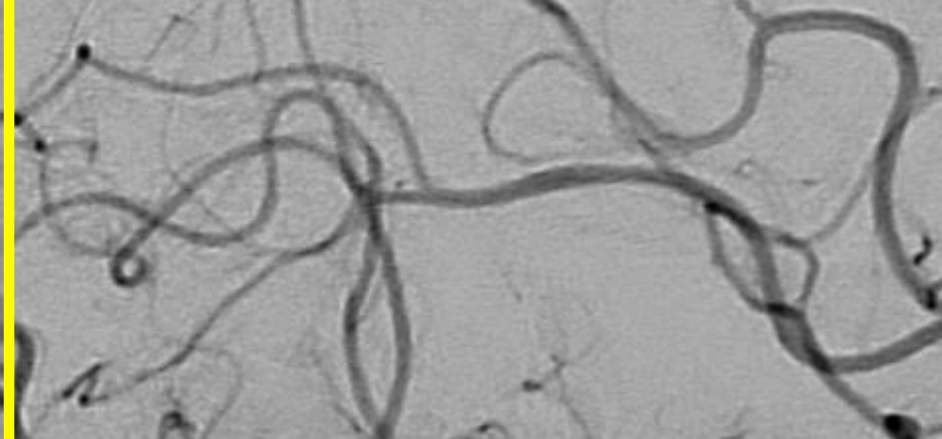
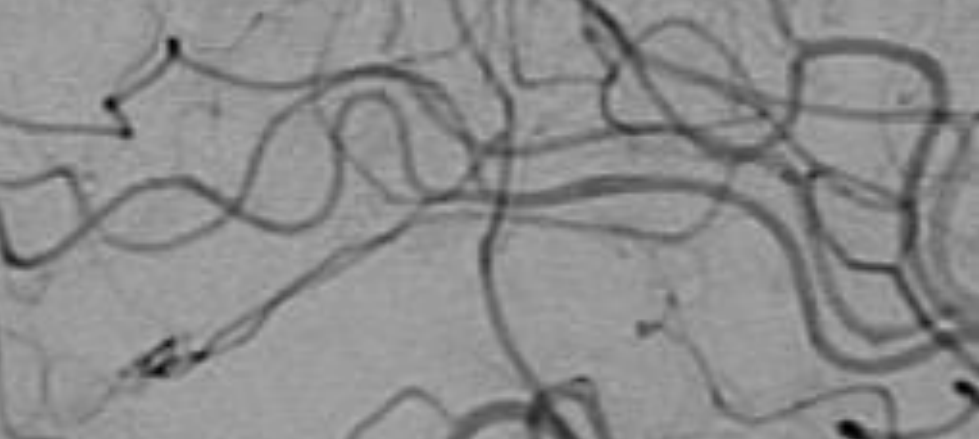


Rot -90.7° Incl +0.0°

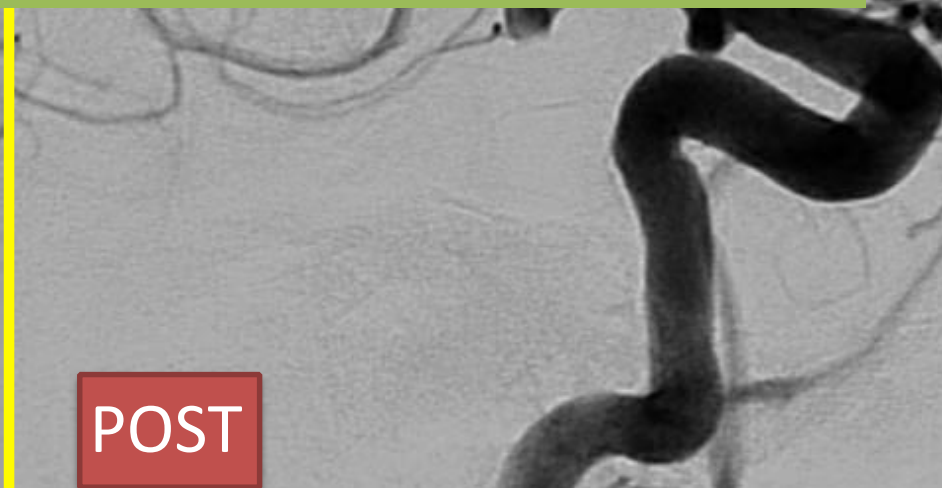
16:20:08.3
05-mars-2016
77 kV, 4 mA, 0 ms

NEURI
BICÊTRE





- 5H40 pm (+7H40): Recanalisation TICI 3
- Almost complete recovery in the angio-suite. Mild remaining lost of words (NIHSS=1)
- Day 6: discharge home



PRE

POST

World Federation of Interventional and Therapeutic Neuroradiology

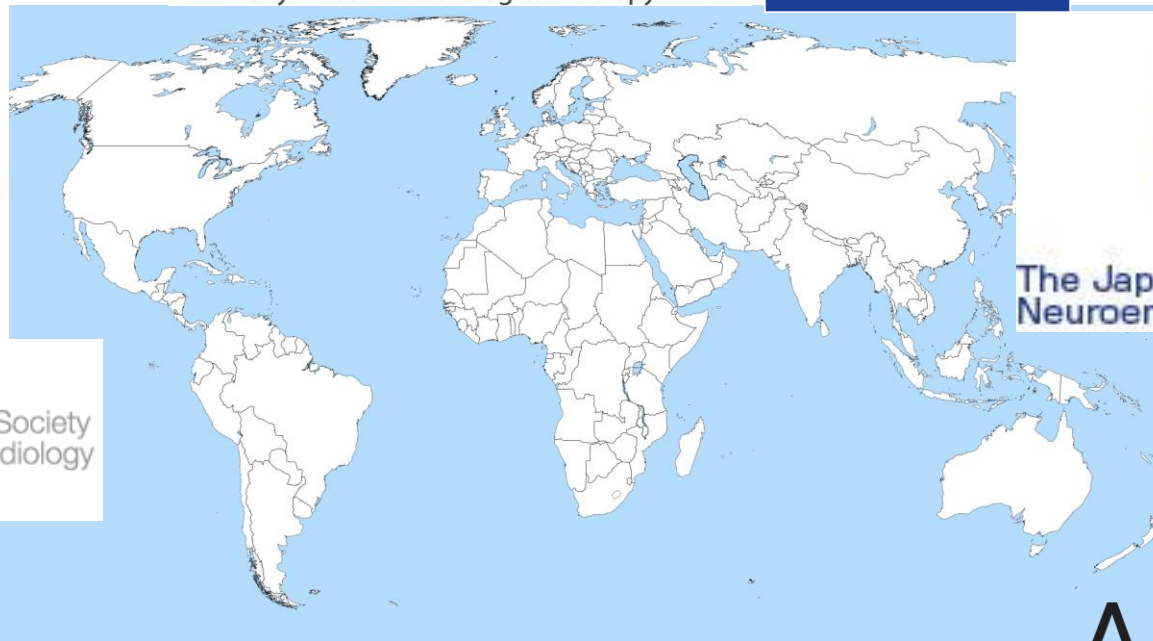


HARVEY CUSHING

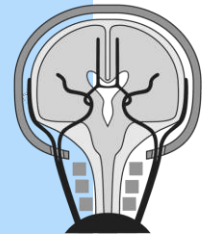
American Association of Neurological Surgeons

ESMINT

European Society of Minimally Invasive Neurological Therapy



The Japanese Society for Neuroendovascular Therapy



ANZSNR



Society of Vascular and Interventional Neurology

ASNR American Society of Neuroradiology



Sociedad Ibero Latino Americana De Neurorradiología Diagnóstica Y Terapéutica

AAFITN

Asian Australasian Federation of Interventional and Therapeutic Neuroradiology

Training Guidelines for Endovascular Ischemic Stroke Intervention: An International Multi-Society Consensus Document

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BACKGROUND

Ischemic stroke is a leading cause of death and disability worldwide. Much of the long-term disability occurs in patients with Emergent Large Vessel Occlusion (ELVO). In fact, in these patients, occlusion of a major intracerebral artery results in a large area of brain injury often resulting in death or severe disability¹. Until recently, intravenous tissue plasminogen activator (t-PA) was the only proven treatment for ELVO.

However, the landscape of stroke treatment has changed with the publication of five randomized multicenter controlled clinical trials. These trials provide Class I, Level A evidence that endovascular thrombectomy (ET) is the standard of care for patients with ELVO. In particular, thrombectomy results in

significantly better clinical outcomes compared to best medical therapy in patients with acute occlusion of the intracranial internal carotid artery (ICA) and/or M1 segment of the middle cerebral artery (MCA)²⁻⁶. These results have led to guideline recommendations advocating for endovascular treatment in addition to t-PA for patients with ELVO. In addition, ET is now offered as first line therapy for patients that are not eligible for intravenous thrombolysis⁷⁻⁹. However, achieving the best possible clinical outcomes with endovascular stroke treatment mandates structured training and education of those physicians who are providing endovascular stroke treatment. On this regard, a recent meta-analysis of these five clinical trials showed that the vast majority of thrombectomies were performed by experienced neurointerventionalists. These include interventional neuroradiologists, endovascular neurosurgeons, and interventional neurologists who routinely perform neuroendovascular procedures¹⁰. None of the studies allowed physicians without previous experience in mechanical

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Recommendations for implementation, registries and further trial

Health authorities are strongly encouraged to implement access to thrombectomy within a reasonable time range in a **network including stroke centres** - *new*.

Need to organize at each country
level a network of Stroke units
connected to INR centers

Thrombectomies during
night and week end:
57%



La devise Shadok de la semaine



LA PLUS GRAVE MALADIE
DU CERVEAU C'EST DE
RÉFLÉCHIR.