

# Ενδοαρθριακή Αντιμετώπιση οξέως ισχαιμικού ΑΕΕ

**ΧΡΗΣΤΟΣ ΓΚΟΓΚΑΣ**

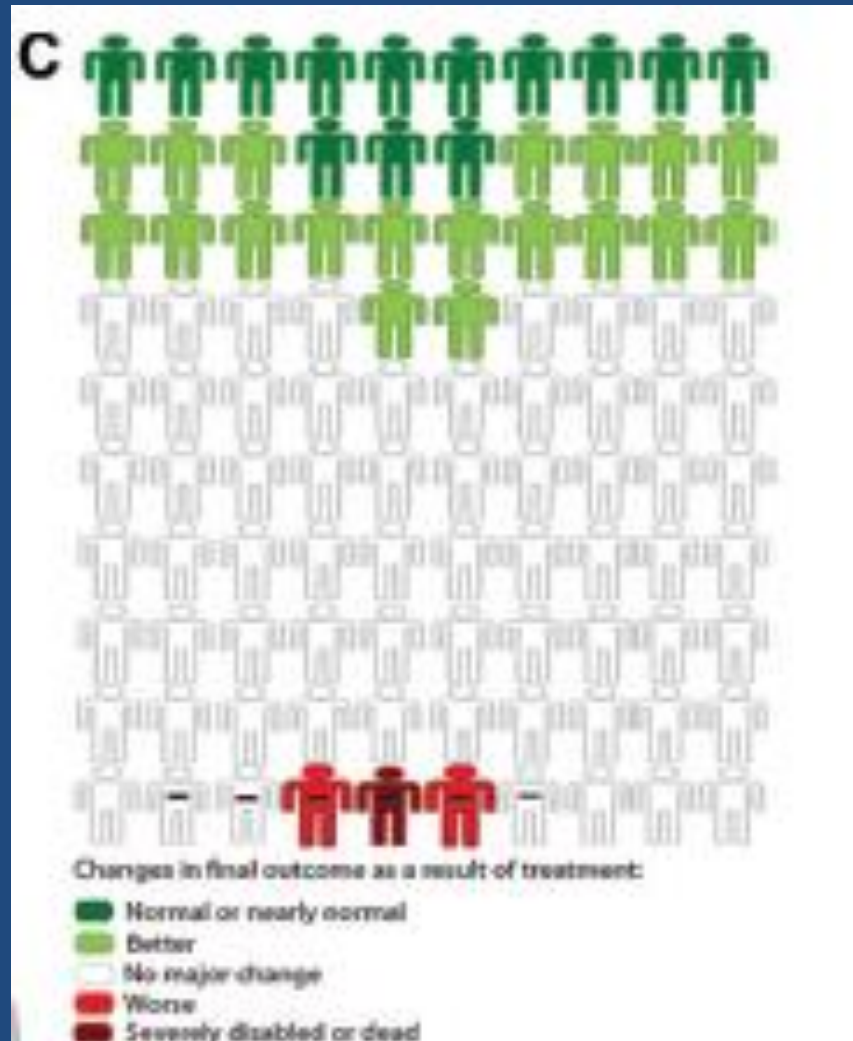
**ΕΠΕΜΒΑΤΙΚΟΣ ΝΕΥΡΟΑΚΤΙΝΟΛΟΓΟΣ**

# Ενδοφλέβια Θρομβόλυση

“The development of thrombolytic stroke therapy was one of the signal triumphs of emergency medicine and neurology at the turn of the twentieth century”

Saver S, et al. Graphic reanalysis of the two NINDS-tPA trials confirms substantial treatment benefit. Stroke 2010;41:2381-2390

# IV tPA 32 στους 100 ασθενείς με κλινικά σημαντική βελτίωση



# Απόφραξη μεγάλου αγγείου

- Το 40% των ενδοκρανιακών αποφράξεων αφορούν μεγάλο μεγέθους εγκεφαλικά αγγεία όπως οι έσω καρωτίδα, η βασική αρτηρία, και το εγγύς τμήμα της μέσης εγκεφαλικής αρτηρίας.
- Η απόφραξη ενός μεγάλου εγκεφαλικού αγγείου από θρόμβο δεν έχει καλή πρόγνωση με ποσοστά θνητότητας από 30-90%.

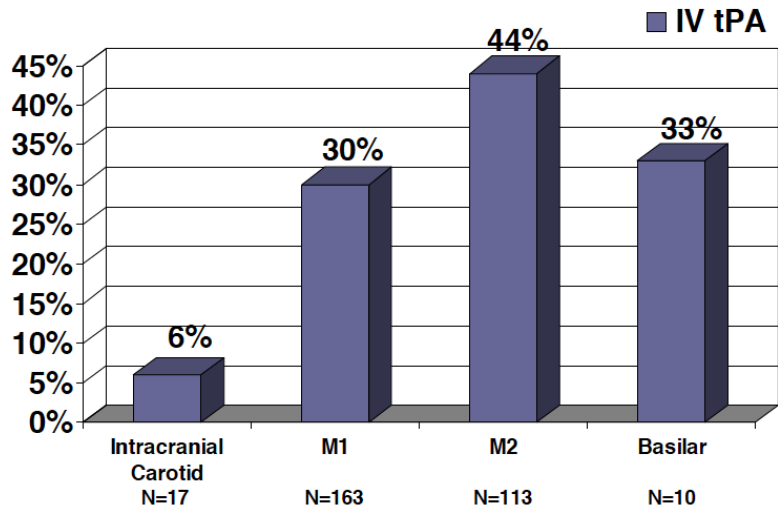
# Στόχος Θεραπείας: Recanalization- Επανασηραγγοποίηση

- Μετα-ανάλυση Stroke 2007
- Rha et al. Impact of recanalization on ischemic stroke. A Meta-Analysis
- Καλύτερη έκβαση
- Μειωμένη θνητότητα

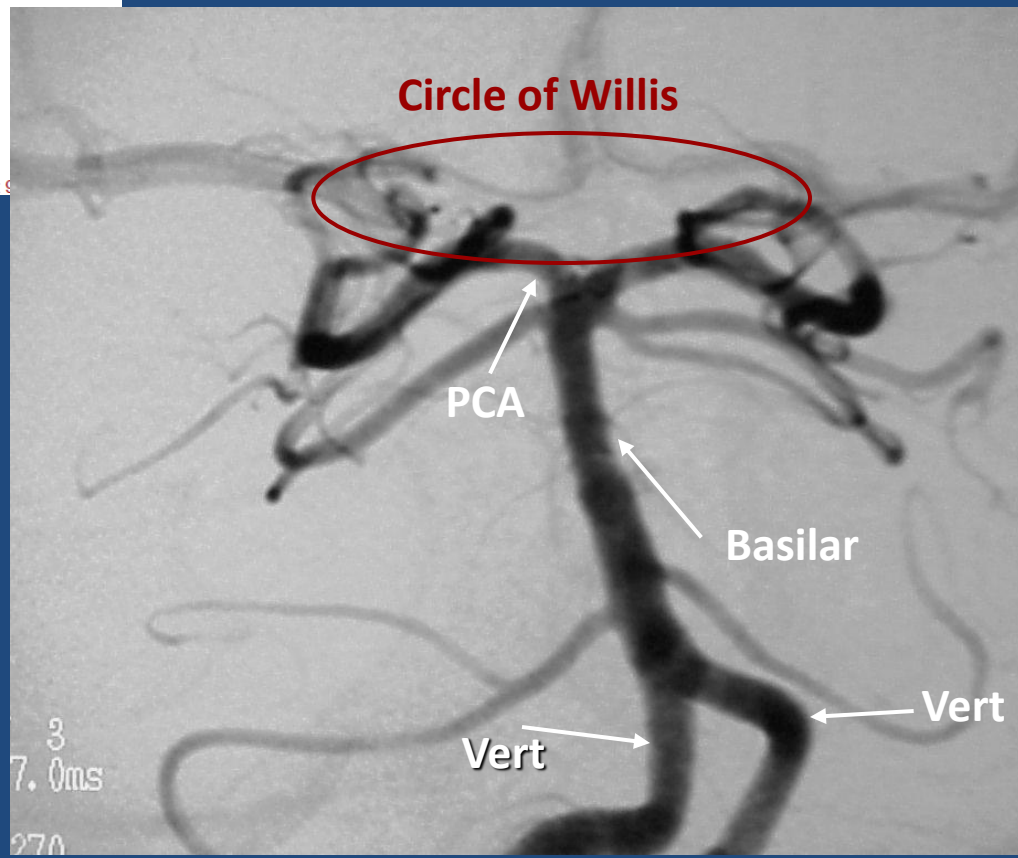
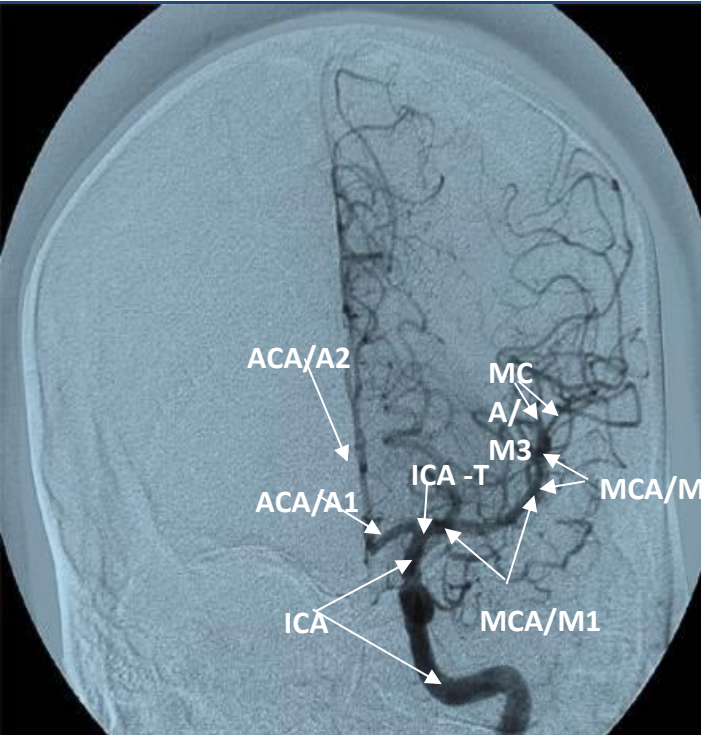
# ΓΙΑΤΙ ΕΝΔΟΑΓΓΕΙΑΚΗ ΘΕΡΑΠΕΙΑ;

- Υψηλότερα ποσοστά επαναιμάτωσης από την ενδοφλέβια θρομβόλυση ιδιαίτερα στις αποφράξεις μεγάλων αγγείων( ICA,BA,M1,A1)
- Ευρύτερο θεραπευτικό χρονικό παράθυρο
- Μπορεί να εφαρμοστεί σε ασθενείς με αντενδείξεις στο iv tPA
- Μπορεί να εφαρμοστεί σε ασθενείς που δεν ανταποκρίνονται στο iv tPA

# Saqqur: IV tPA Revascularization Rates By Vessel



*Stroke. 2007 Mar;38(3):5*



# Πρόγνωση απόφραξης μεγάλου αγγείου

Ποσοστά θνητότητας:

- Carotid-T: 53%-73% Jansen, 1995
- MCA: 30-35% Chambers, 1987
- Basilar: 89-92% Bruckman H, 1986 & Brandt, 1996





# Γυναίκα 62 ετών με αιφνίδια απώλεια συνείδησης

- Αιφνίδια πτώση στο έδαφος
- Μεταφορά στο νοσοκομείο σε 50 λεπτά από τους οικείους της
- National Institute of Health Stroke Scale NIHSS 22
- GCS 14

# Hyperdense MCA



# Θεραπεία

Θρομβολυτική αγωγή με Αλτεπλάση ενδοφλεβίως σε δόση 0,9mg/kg εντός 60 λεπτών

Έναρξη θεραπείας 1.5 ώρες από την εκδήλωση του επεισοδίου

Χωρίς κλινική ανταπόκριση

# DSA τραχήλου εγκεφάλου χωρίς γενική αναισθησία

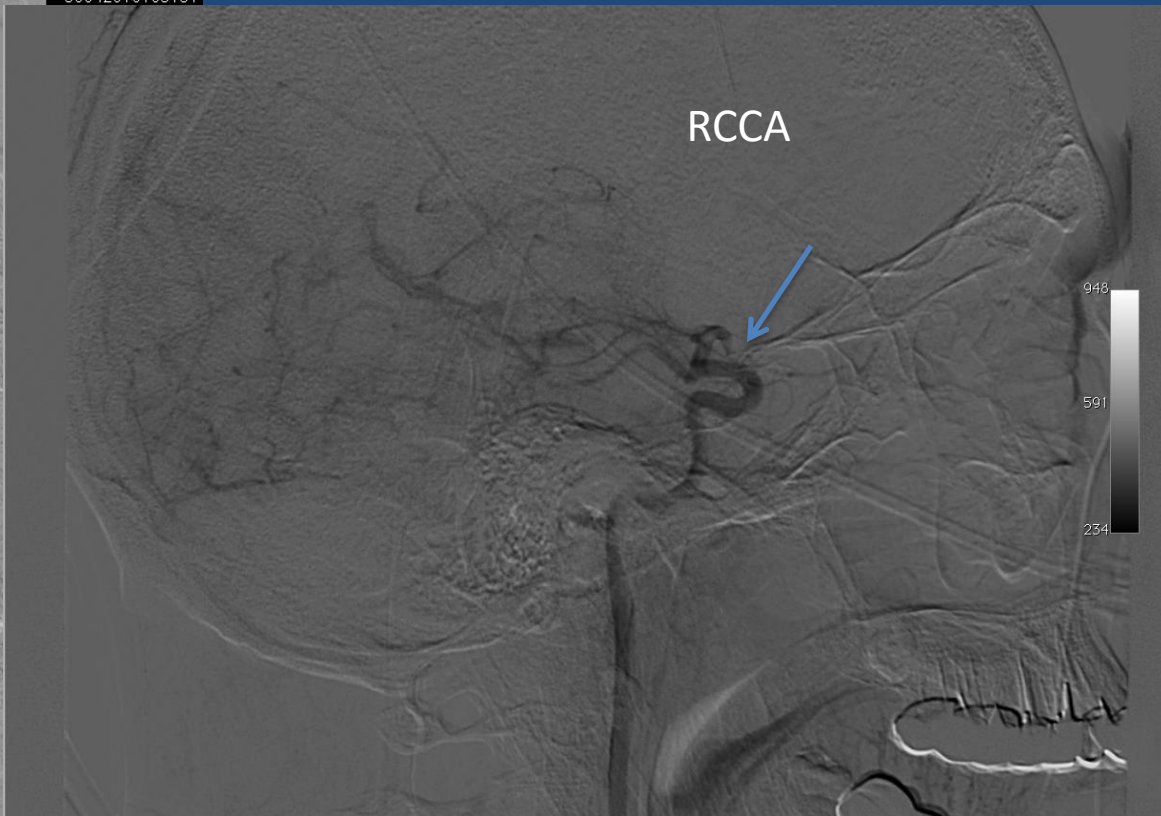
Image size: 1024 x 1024  
View size: 825 x 851  
WL: 460 WW: 527  
X: 319 px Y: 970 px Value: 499.00

Date: 2010.04.30; Time: 21:09:31 ( 61 y, 61 y )  
Cerebral (fr) - unnamed  
30042010183731

RCCA



RCCA

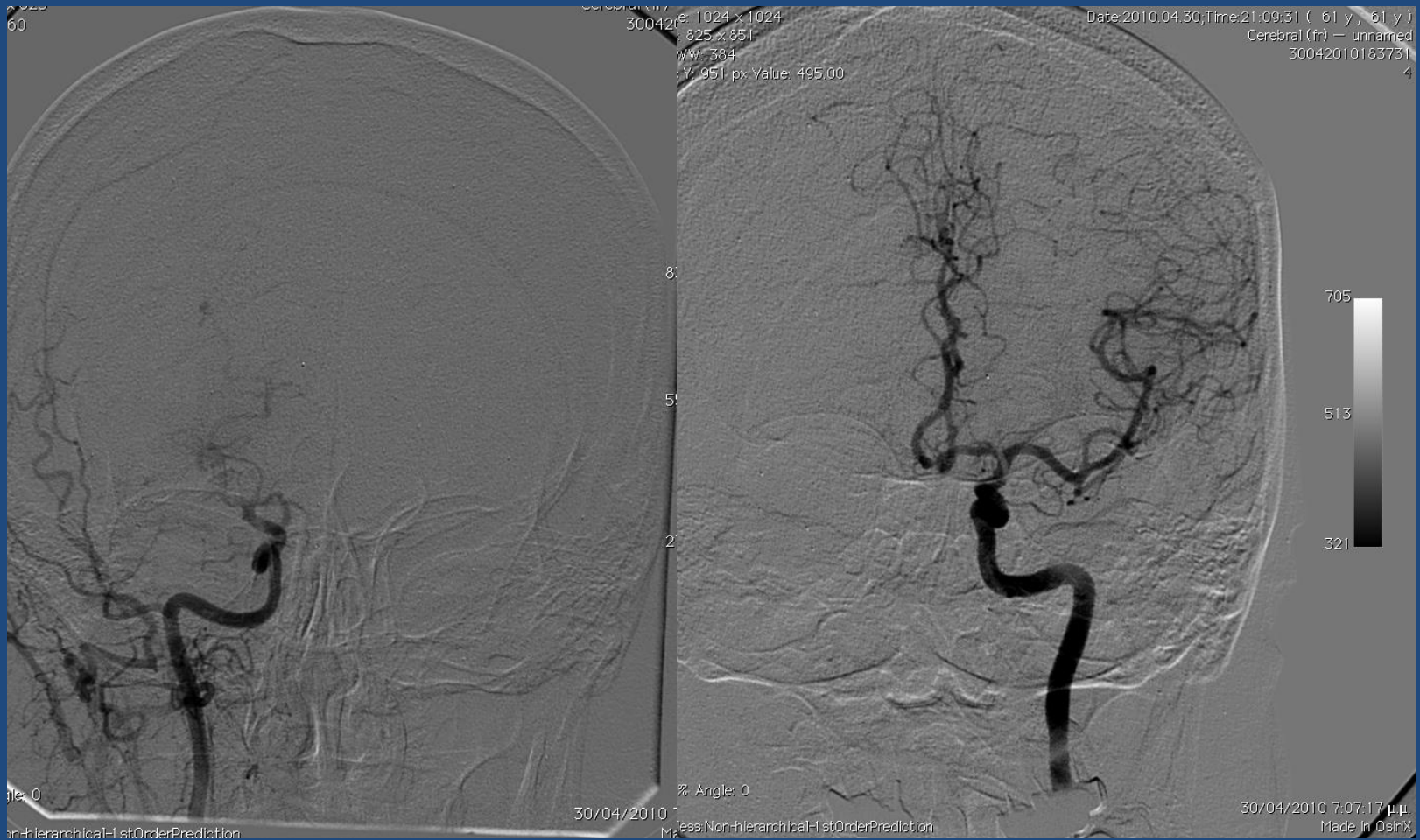


Zoom: 91% Angle: 0  
In: 6/11  
JPEG Lossless Non-hierarchical Histogram Prediction

30/04/2010 7:02:34 μ.μ.  
Made In OsirX

# RCCA

# LICA

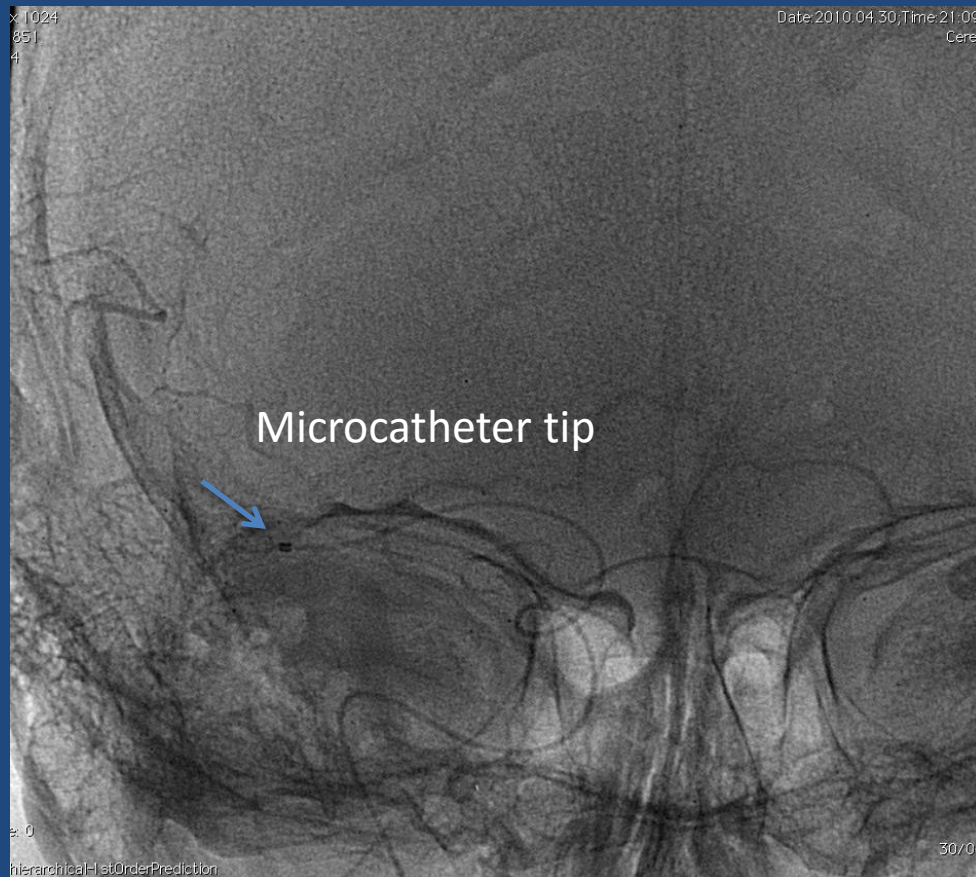


# Angioplasty RICA

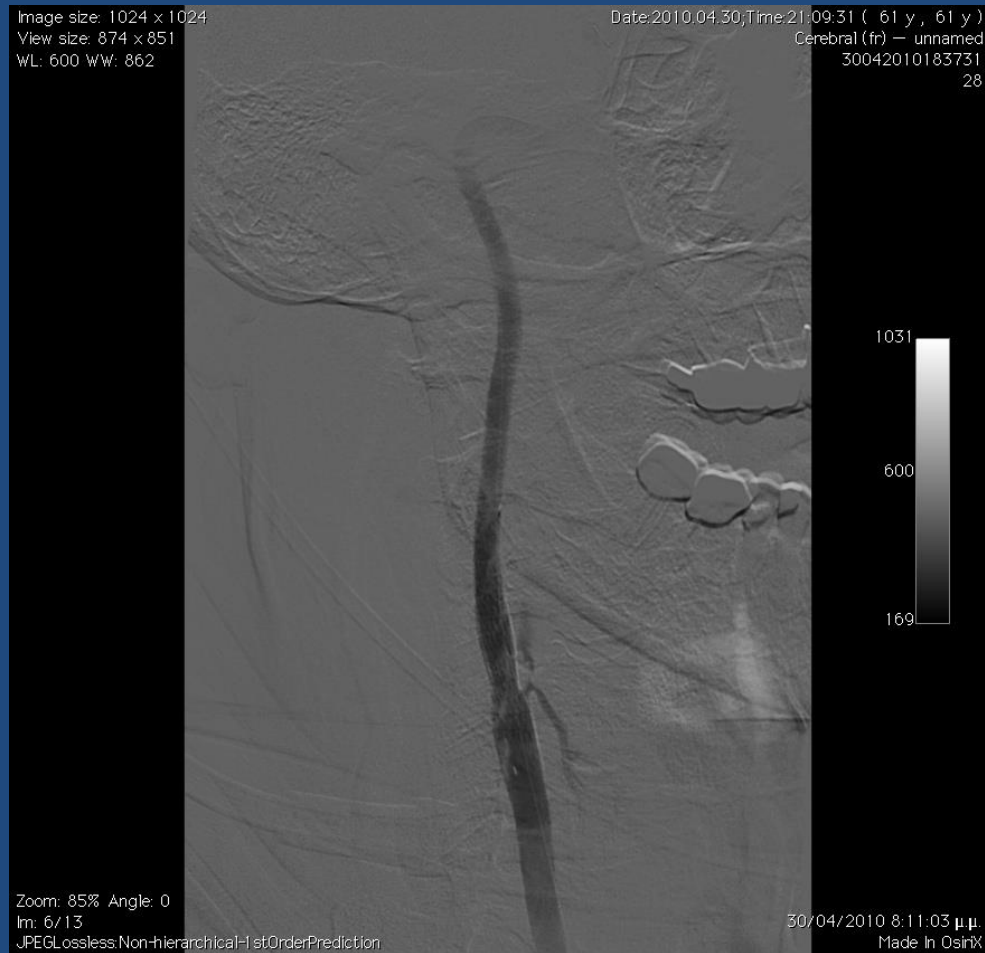




# Θρομβεκτομή με σύστημα MERCI



# RICA stenting





# Τελική DSA μετά θρομβεκτομή με σύστημα MERCI

Image size: 1024 x 1024  
View size: 857 x 851  
Pixel size: 512 W/W: 256

Date: 2010.04.30; Time: 21:09:31 ( 61 y, 61 d)  
Cerebral (fr) — v size: 857 x 851  
300420 512 W/W: 256  
70 px Y: 1005 px Value: 495.00

Date: 2010.04.30; Time: 21:09:31 ( 61 y, 61 d)  
Cerebral (fr) — unna  
30042010183

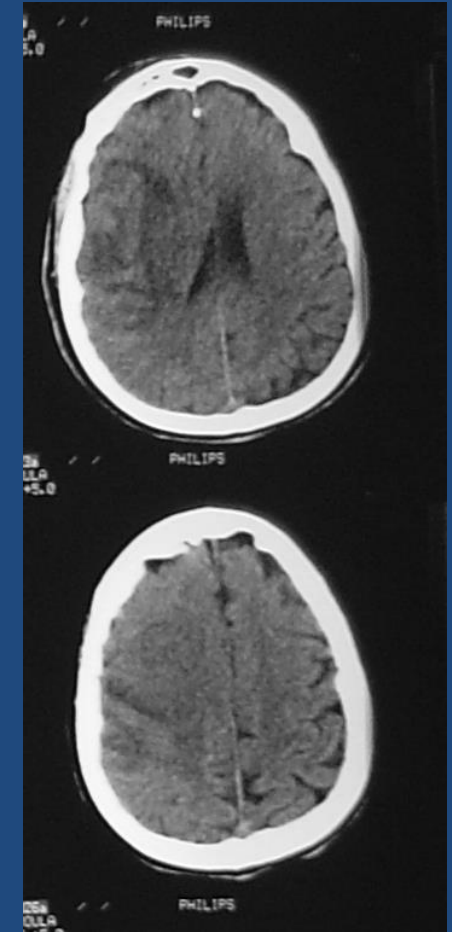
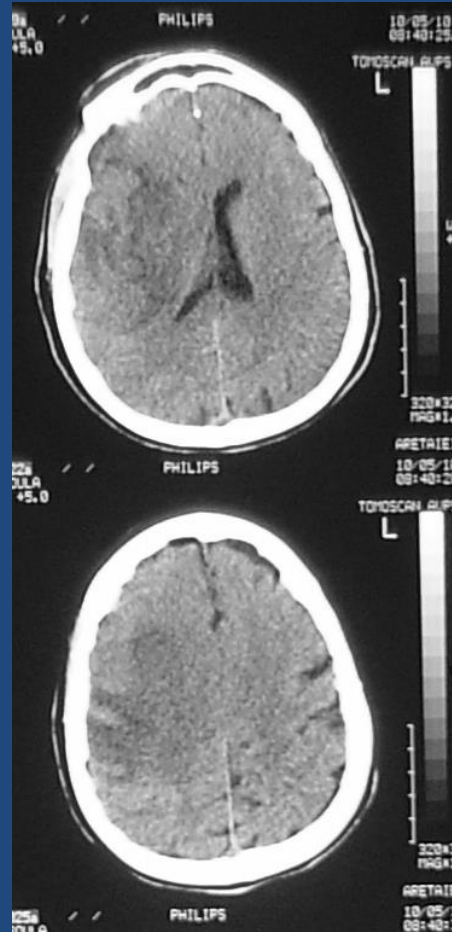
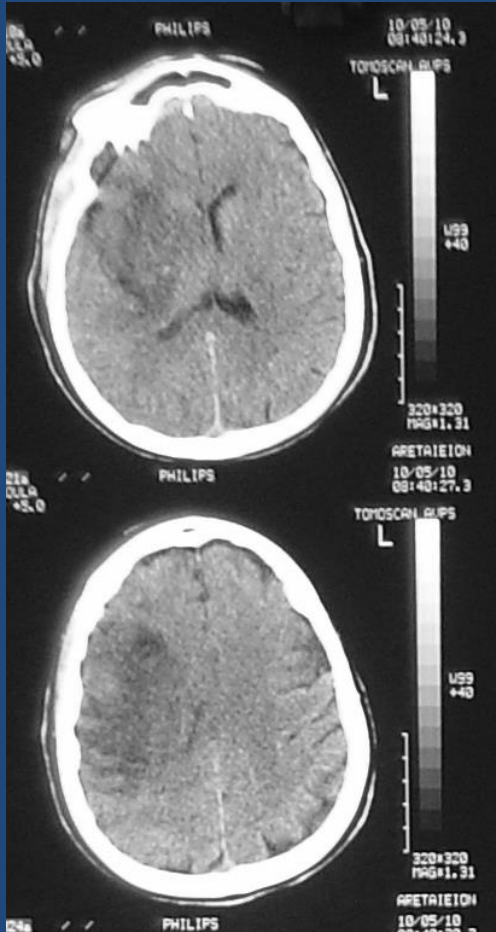


m: 84% Angle: 0  
6/18  
Lossless: Non-hierarchical-IstOrderPrediction

m: 84% Angle: 0  
30/04/2010 8:7/18  
MacLossless: Non-hierarchical-IstOrderPrediction

30/04/2010 8:11:39  
Made In O

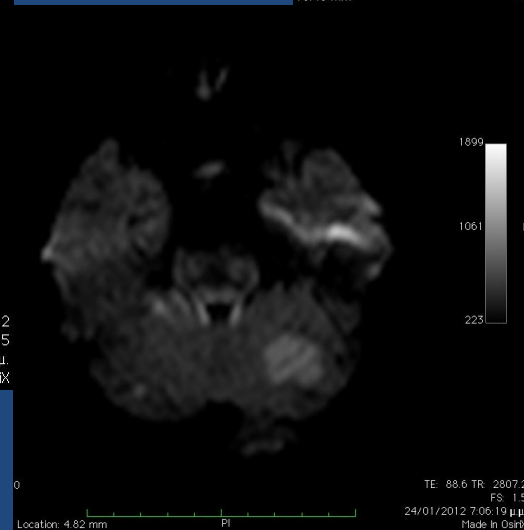
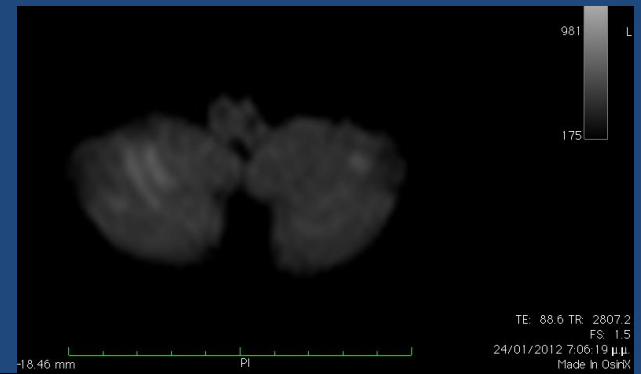
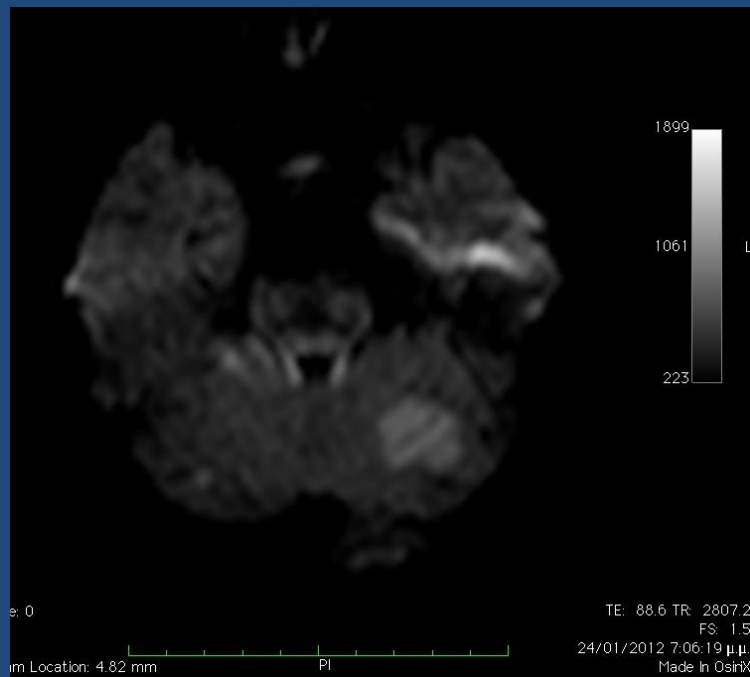
# ΥΤ μετά 10 ημέρες



# Κλινική ανταπόκριση

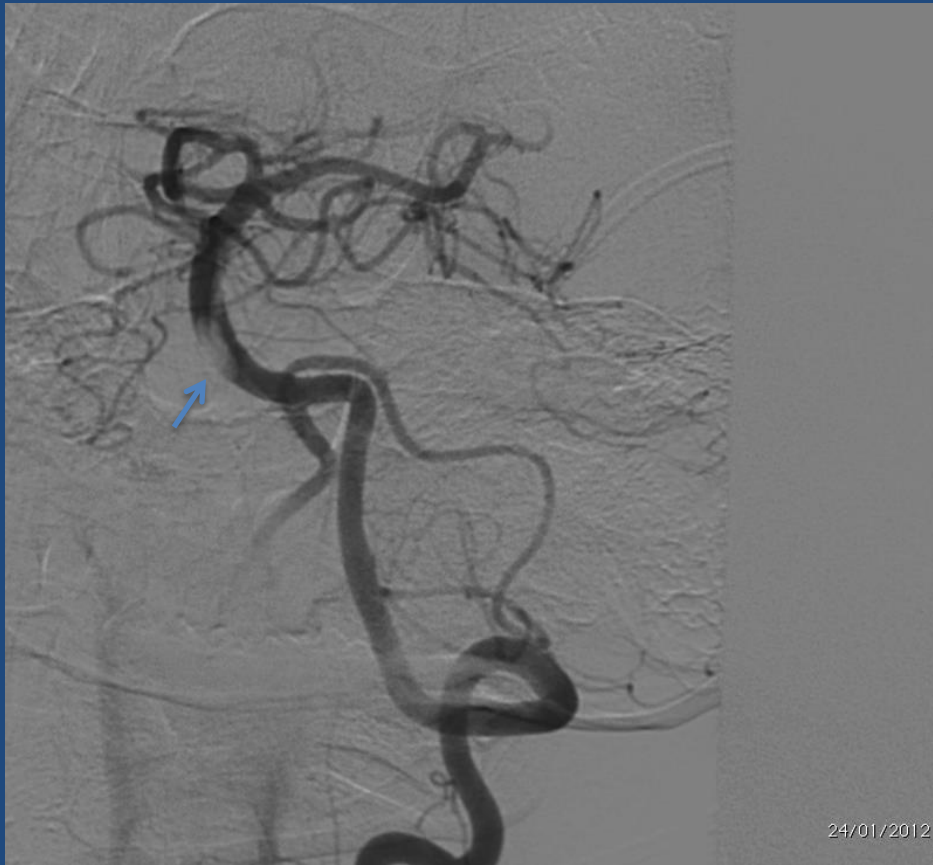
- Βελτίωση του NIHSS από 21 σε 17 αμέσως μετά την επέμβαση.
- mRS 4 στις 30 μέρες
- mRS 2 στις 90 μέρες

# 21 ετών αθλητής με εμέτους, ζάλη και αιφνίδια απώλεια ακοής δεξιά από 12ώρου. Πτώση επιπέδου συνείδησης

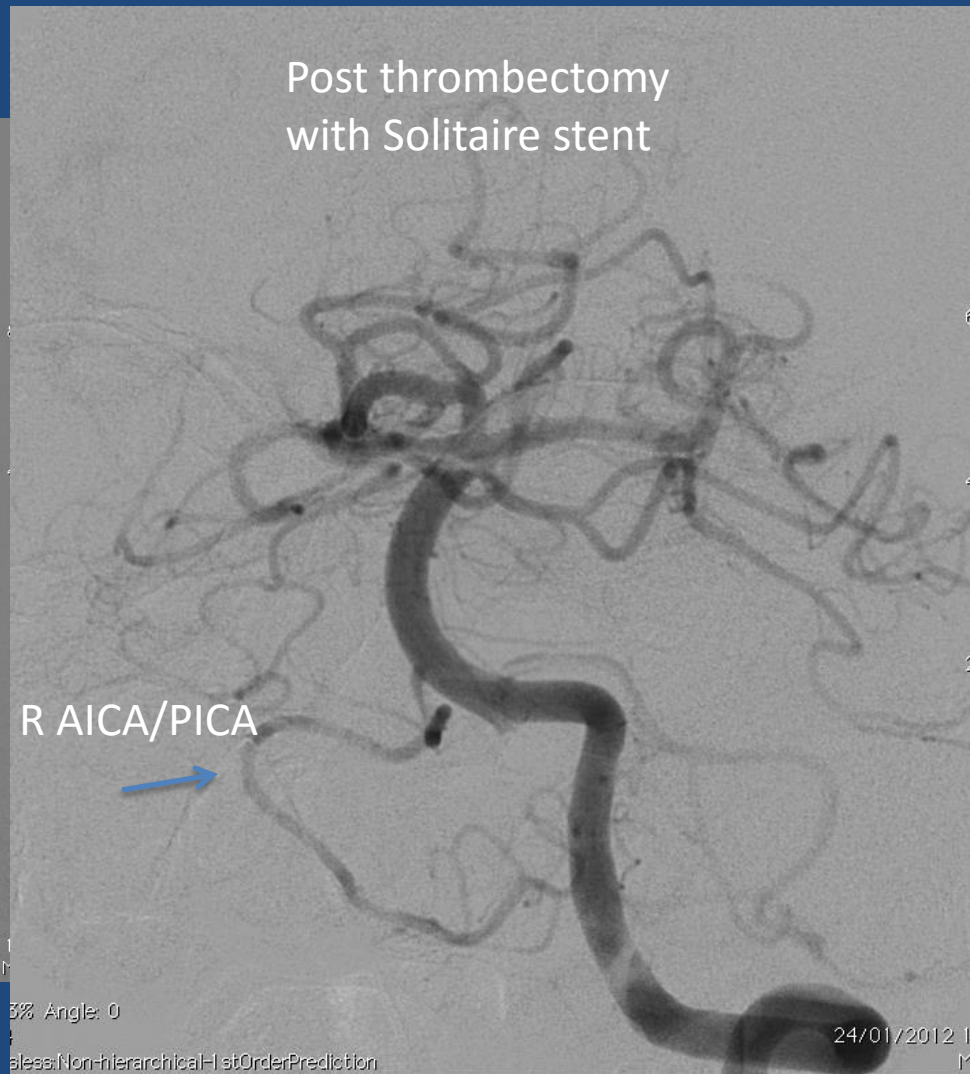




# Υφολική απόφραξη βασικής αρτηρίας



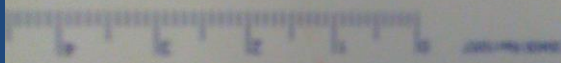
24/01/2012



3% Angle: 0

bles: Non-hierarchical-H stOrderPrediction

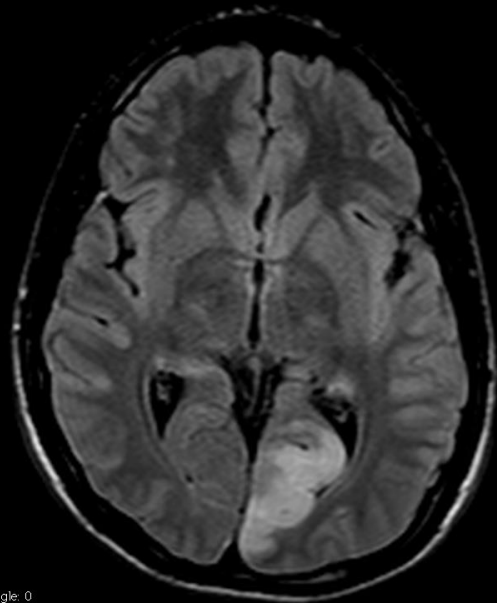
24/01/2012



shearing maneuvers.

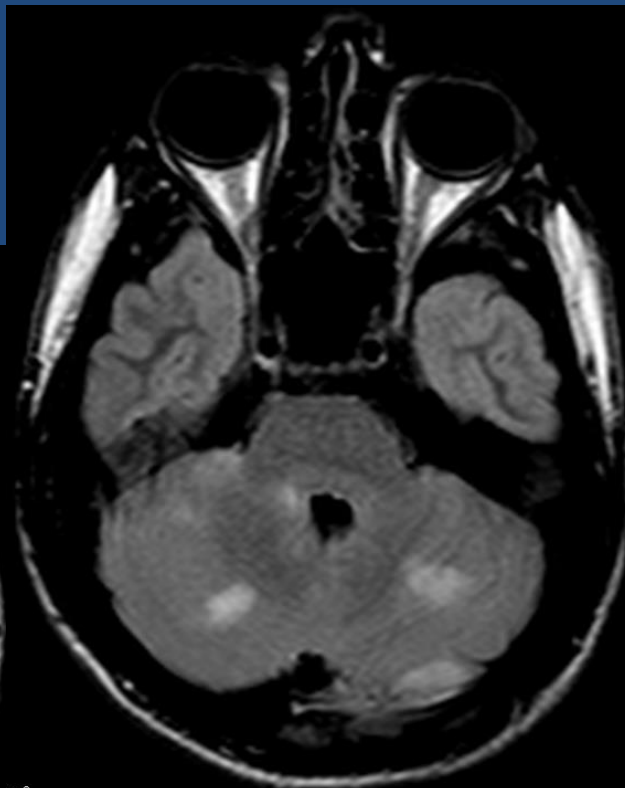
1. Remove shearing maneuver from distal tip of the catheter.
2. Carefully bend catheter tip and a desired shape. A slight over bend shape may be required to account for catheter relaxation.
3. Shape the catheter by holding the approximately 1 inch (2.5 cm) end from the steam source for about 20 NOT EXCEED 30 SECONDS.)
4. Allow catheter tip to cool in air or saline prior to reinserting maneuver.
5. Remove maneuver from catheter and. Multiple shearing is not recommended.
6. Inspect the tip for any damage that is resulted from shearing shearing the catheter. Any damage is found, do not use the





Angle: 0  
27/01/2012 9:12:27 π.μ.  
Made in OsiriX

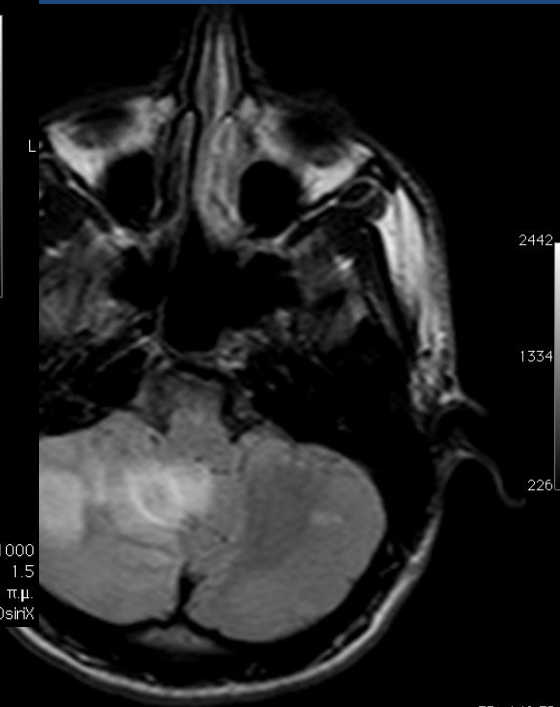
TE: 140 TR: 11000  
FS: 1.5  
27/01/2012 9:12:27 π.μ.  
Made in OsiriX



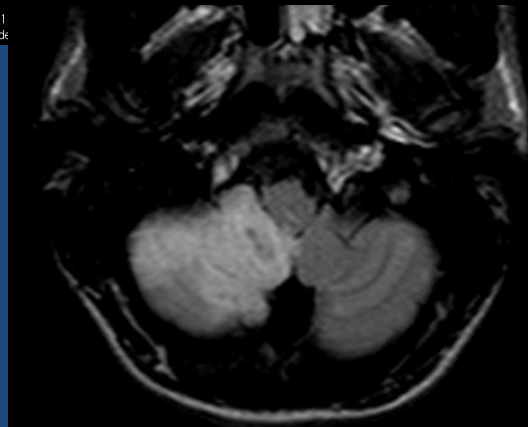
Angle: 0  
27/01/2012 9:12:27 π.μ.  
Made in OsiriX

TE: 140 TR: 11000  
FS: 1.5  
27/01/2012 9:12:27 π.μ.  
Made in OsiriX

2187  
1313  
439



2442  
1334  
226



Angle: 0  
27/01/2012 9:12:27 π.μ.  
Made in OsiriX

TE: 140 TR: 11000  
FS: 1.5  
27/01/2012 9:12:27 π.μ.  
Made in OsiriX

2500  
1523  
478

TE: 140 TR: 11000  
FS: 1.5  
27/01/2012 9:12:27 π.μ.  
Made in OsiriX

TE: 140 TR: 11000  
FS: 1.5  
27/01/2012 9:12:27 π.μ.  
Made in OsiriX

# Κλινική έκβαση στις 90 ημέρες

- Απώλεια ακοής δεξιά



**Ασθενής 36 ετών με οξεία  
εμφάνιση αφασίας και δεξιά  
ημιπληγία**

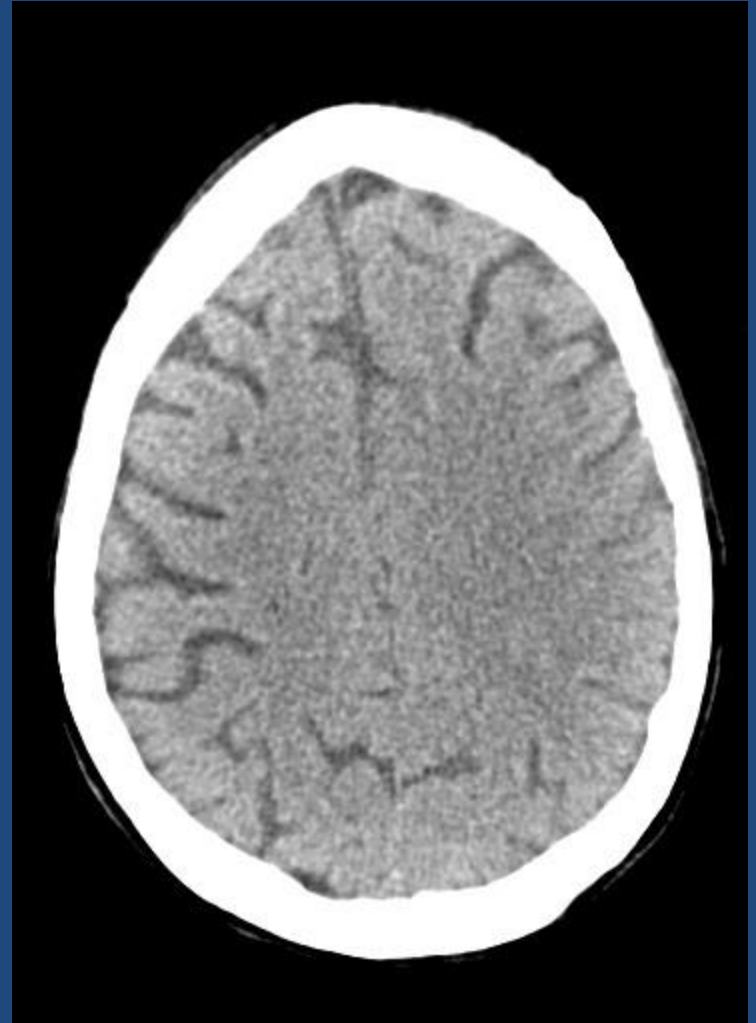
# ΙΣΤΟΡΙΚΟ

- Ρευματικός πυρετός
- Αντικατάσταση μιτροειδούς βαλβίδος πριν τέσσερις μήνες

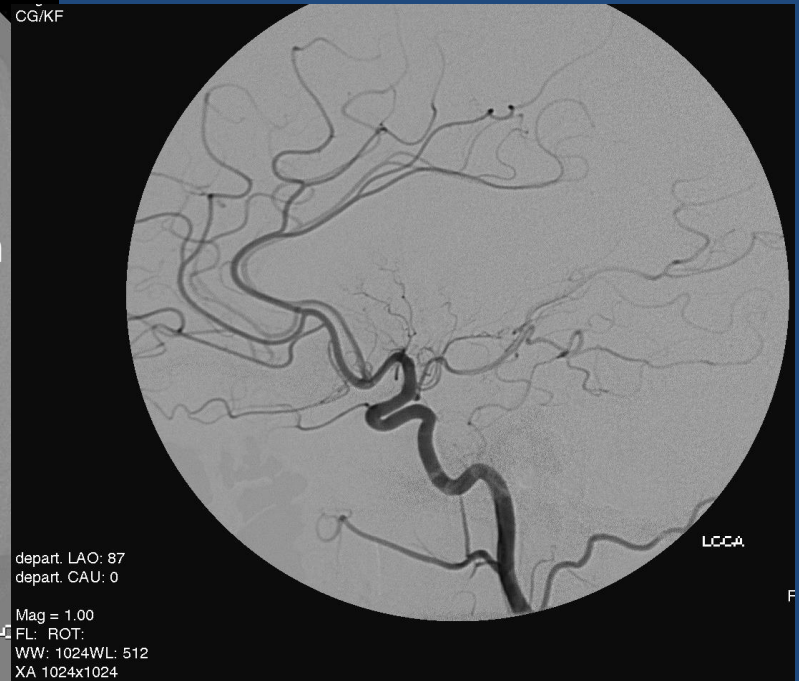
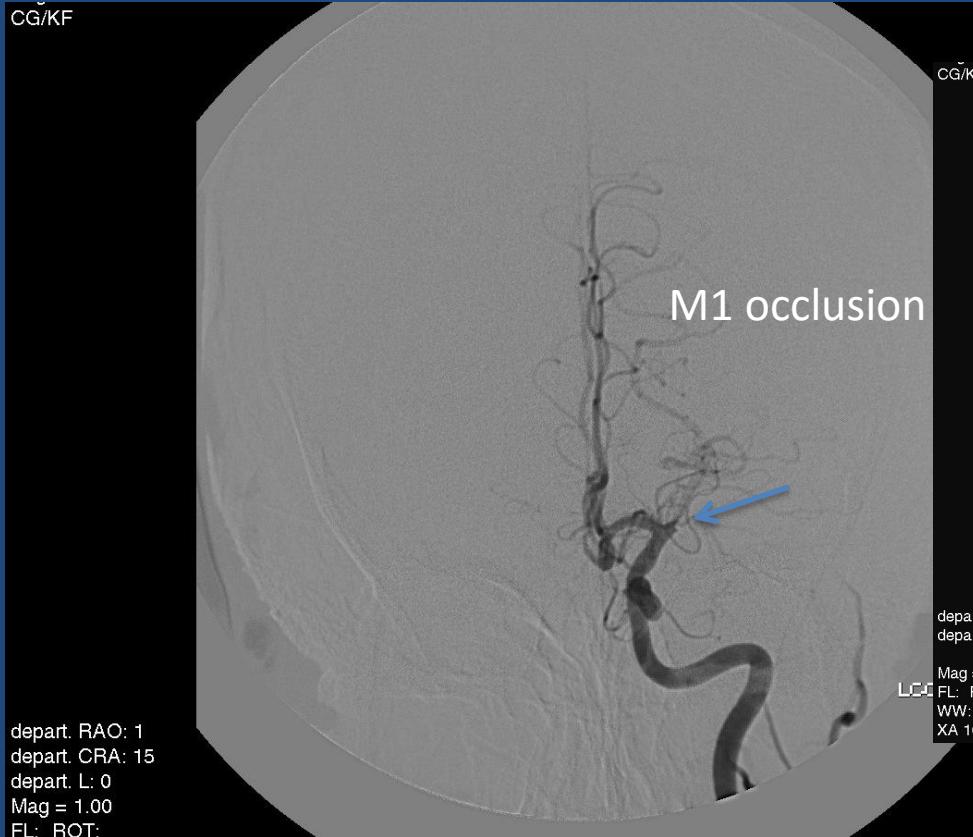
# ΚΛΙΝΙΚΗ ΕΞΕΤΑΣΗ

- Αφασία κατανόησης και εκπομπής
- Δεξιά ημιπληγία
- NIH Stroke Scale 25

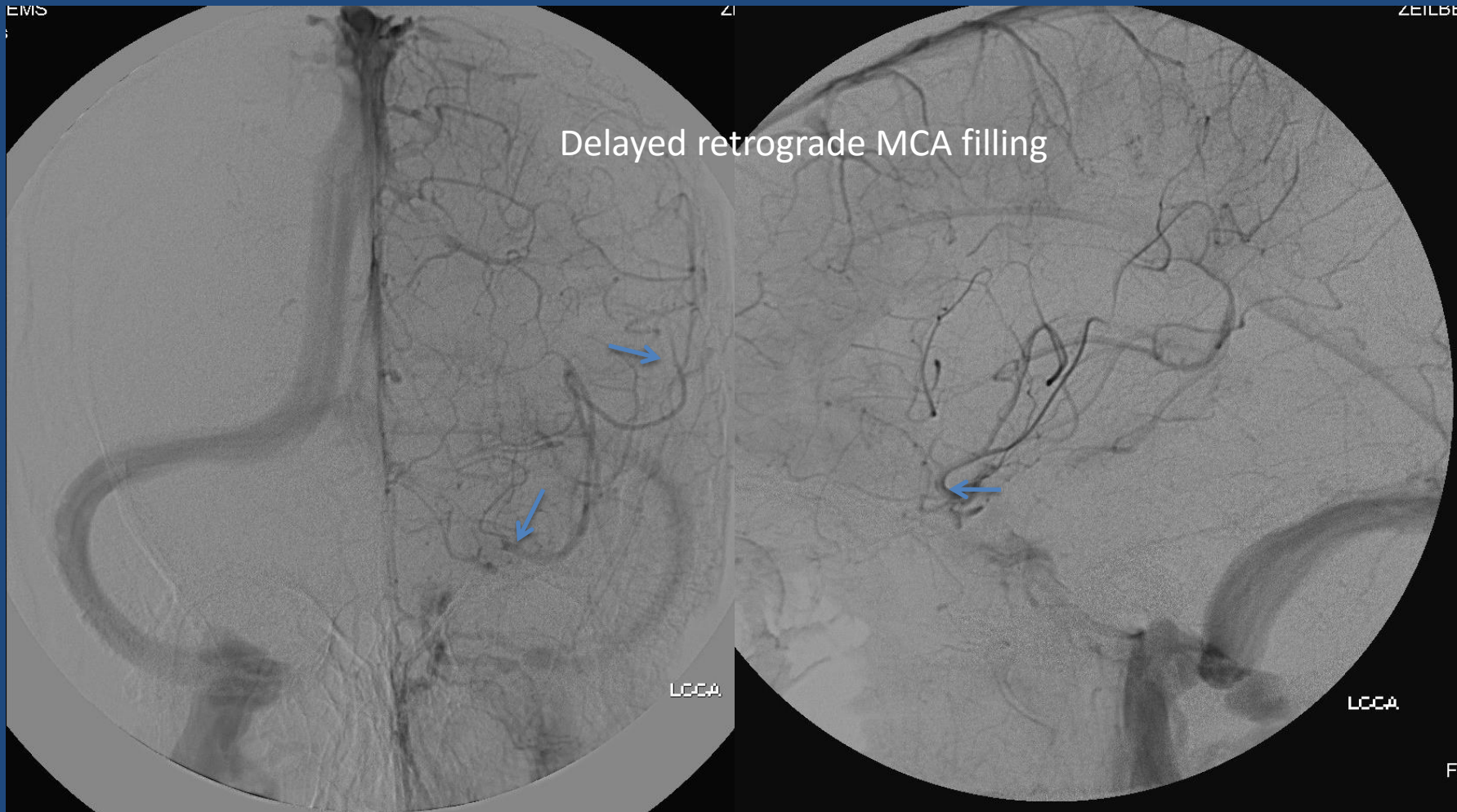
# Υπεγκεφάλου 4 hrs μετά την έναρξη της συμπτωματολογίας



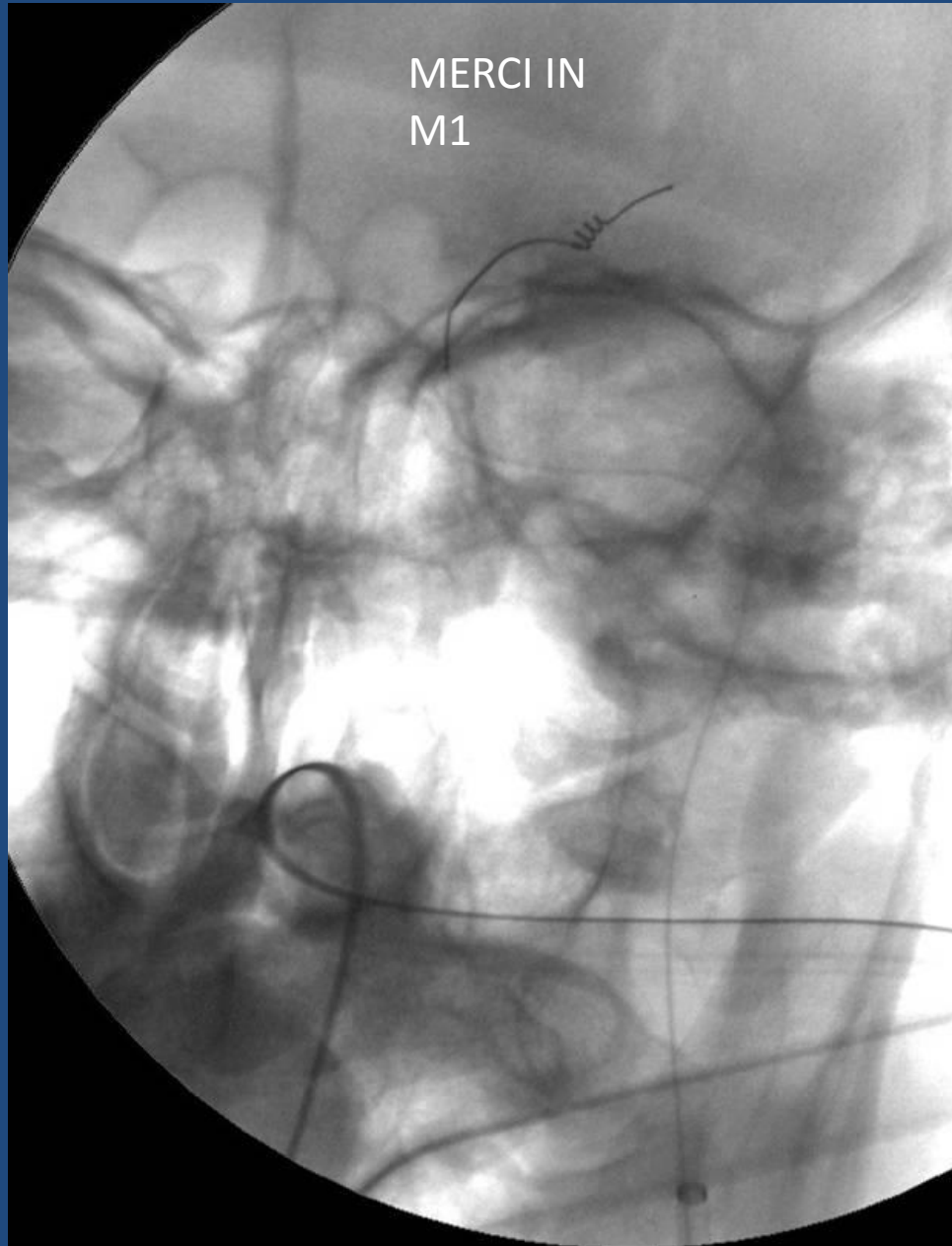
# DSA αρτηριακή φάση



# DSA φλεβική φάση



MERCI IN  
M1



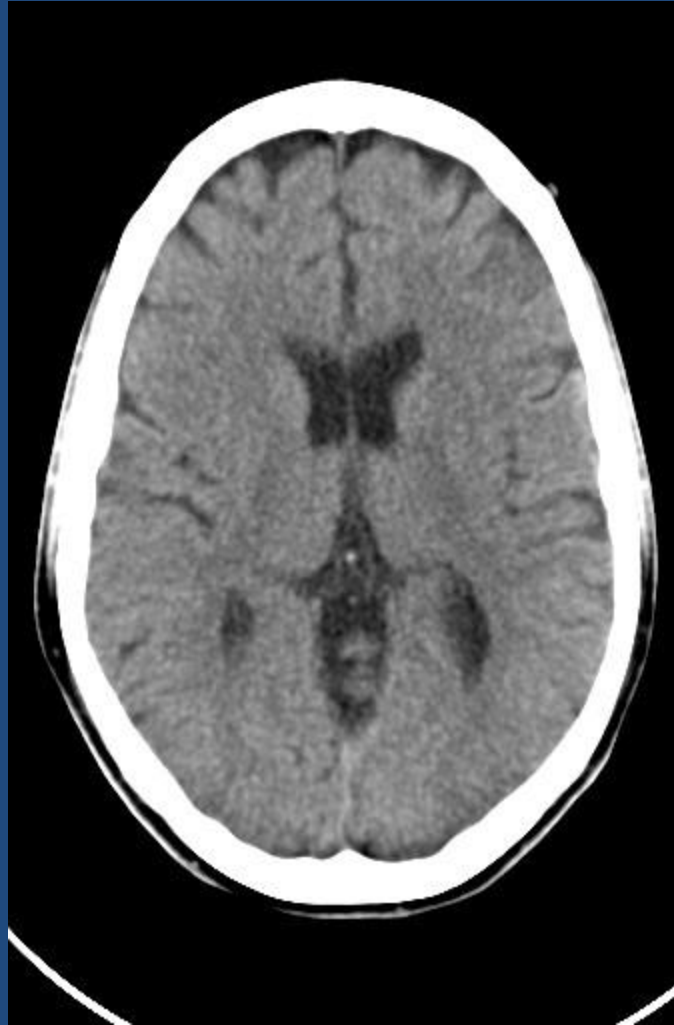


# DSA μετά θρομβεκτομή και 4mg tPA- αρτηριακή φάση





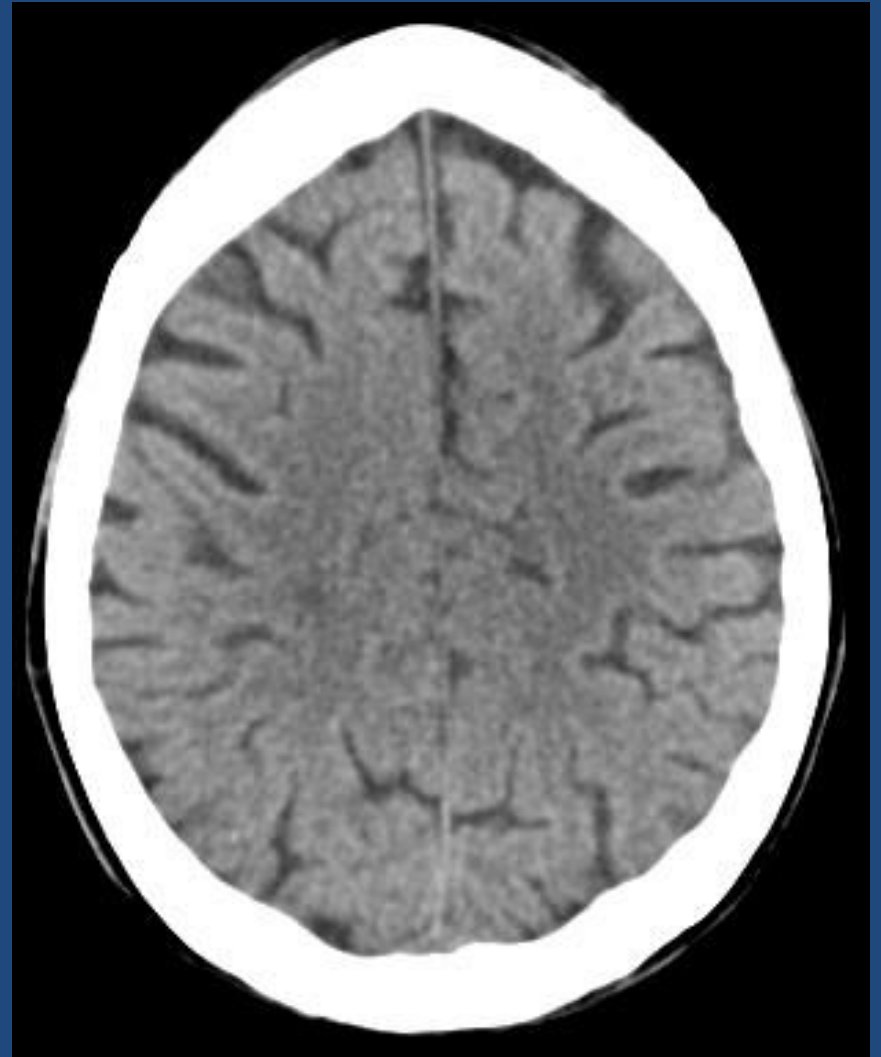
**ΥΤ 24 ώρες μετά την επέμβαση NIHSS 0**

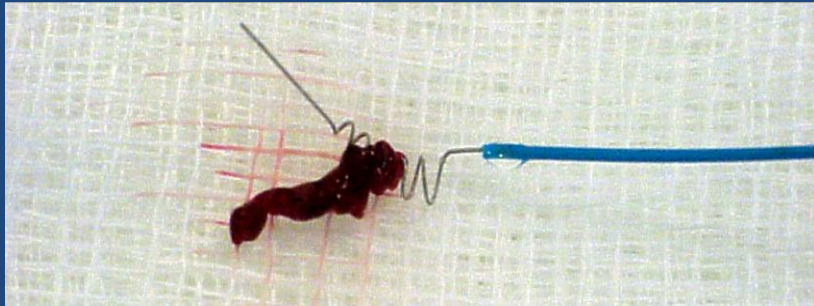


ΠΡΙΝ

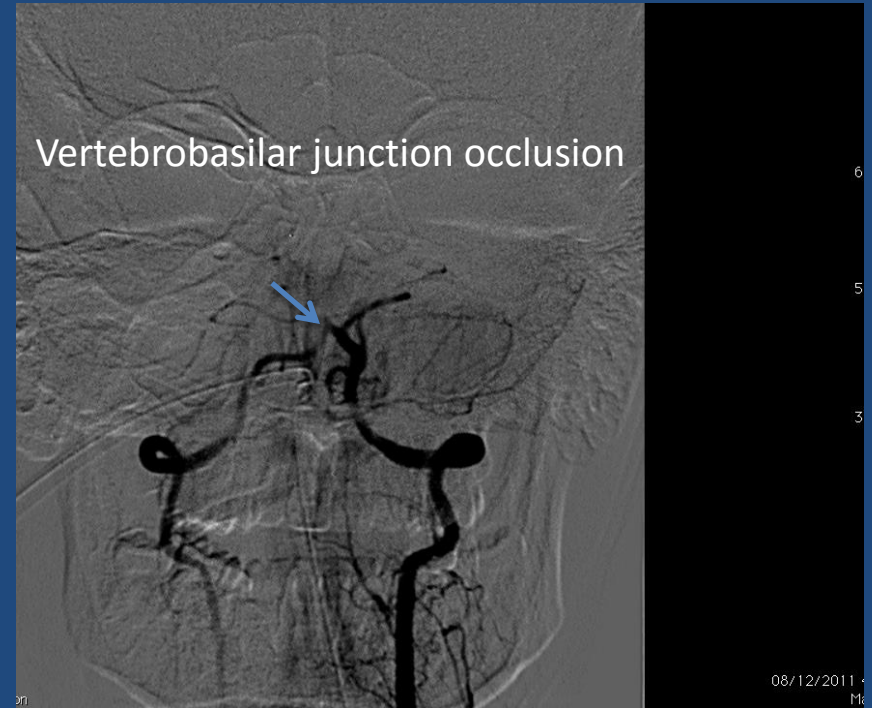


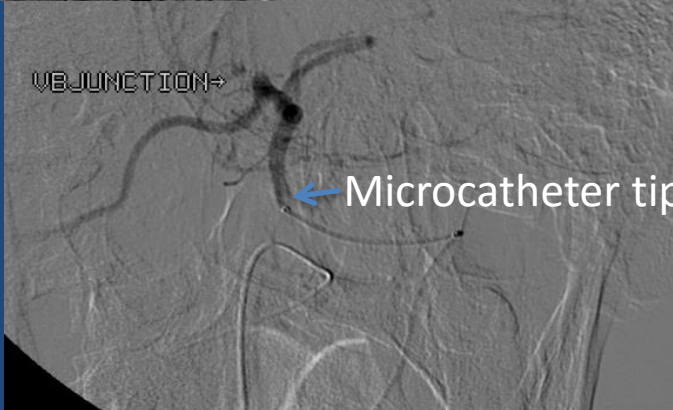
ΜΕΤΑ





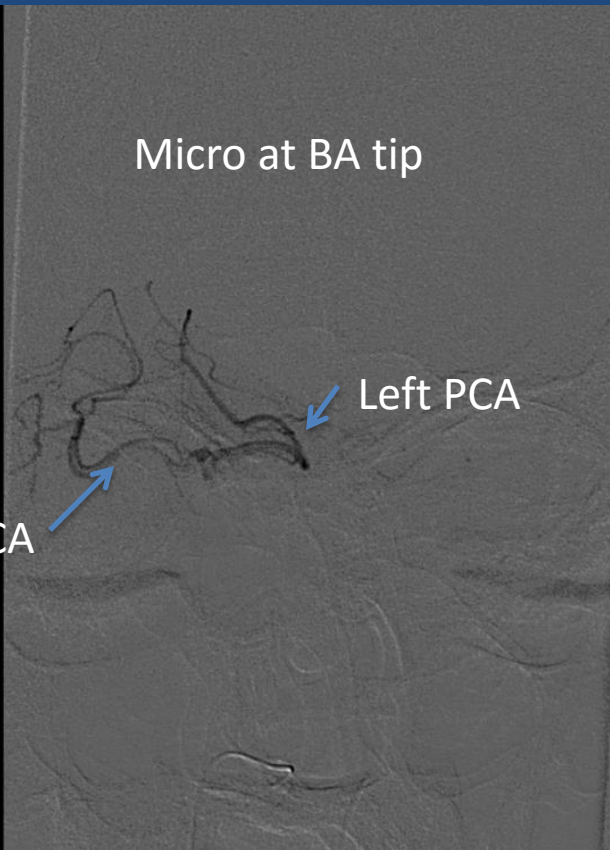
# 28 ετών με απόφραξη βασικής αρτηρίας Locked in syndrome





ww: 255  
h: 1006 px Value: 200.00  
mm Y: 0.001 mm Z: 0.00 mm

BA TIP



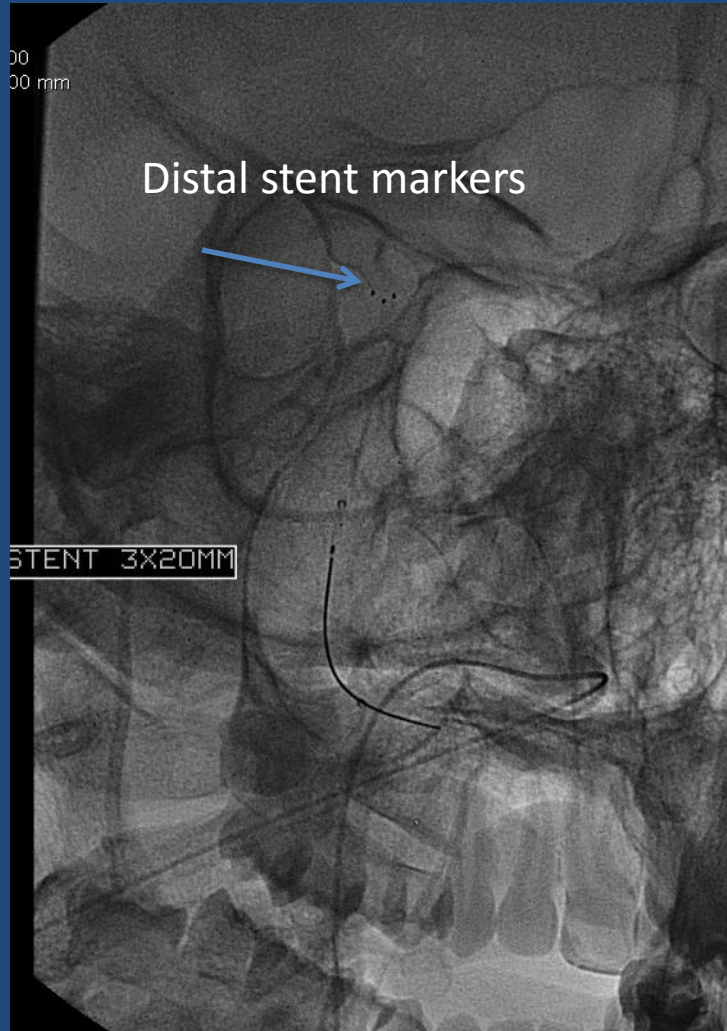
GOGAS

-1stOrderPrediction

sk :

age :





-1stOrderPrediction



derPrediction

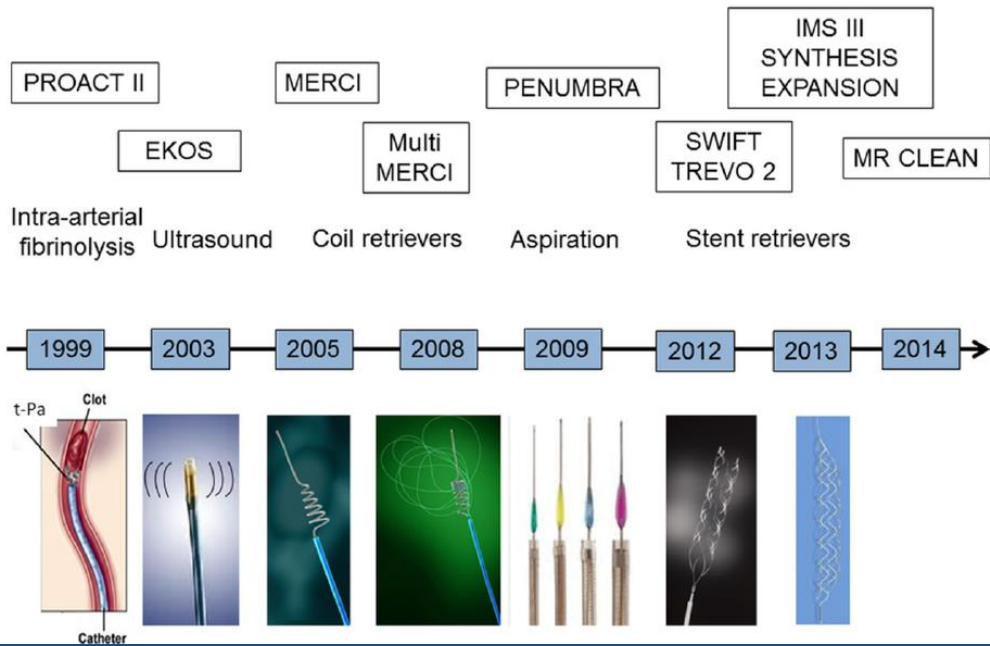
08122013  
GOGAS CHRIS

MASK\_I  
08/12/2011 4:2  
Made



# Techniques for Endovascular Treatment of Acute Ischemic Stroke

## From Intra-Arterial Fibrinolytics to Stent-Retrievers



**Figure 1.** Evolution of endovascular techniques for acute ischemic stroke and clinical trials. IMS indicates Interventional Management of Stroke; MERCI, Mechanical Embolus Removal in Cerebral Ischemia; MR CLEAN, Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands; PROACT, Prolyse in Acute Cerebral Thromboembolism; SWIFT, Solitaire With the Intention for Thrombectomy; and TREVO, Thrombectomy Revascularization of Large Vessel Occlusions in Acute Ischemic Stroke.



# MR CLEAN Trial

**AIM:** To assess the effect of intra-arterial treatment on functional outcome after acute ischemic stroke caused by - **a proven** - intracranial arterial occlusion, against a background of best medical management (with or without IV tPa)

Berkhemer et al, NEJM, January 2015

# MR CLEAN

- **Πρώτη** μελέτη που έδειξε καλύτερα κλινικά αποτελέσματα για την ενδοαυλική θεραπεία
- Υψηλότερα ποσοστά επαναιμάτωσης
- Μικρότερος όγκος ισχαιμικής βλάβης

# MR CLEAN CONCLUSION

- The Mr Clean trial is the **first** trial to show that intra-arterial treatment within 6 hours from stroke onset in patients with acute ischemic stroke caused by an intracranial arterial anterior circulation occlusion is **safe and... clinical effective!**

# Five Randomized Prospective Trials Supporting Stent Thrombectomy for Large Vessel Acute Stroke: Results

	MR CLEAN (Netherlands)	SWIFT PRIME (Global)	EXTEND IA (AUS, NZ)	REVASCAT (Spain)	ESCAPE (Global)
<b>mRS 0-2 at 90 days IV tPA + Endovascular vs. IV tPA alone</b>	<b>32.6% vs 19.1%</b>	<b>60% vs 35%</b>	<b>71% vs 40%</b>	<b>43.7 vs 28.2%</b>	<b>53% vs 29%</b>
<b>% Recanalized TICI 2b-3</b>	59%	88%	86%	66%	73%
<b>Median Time from Stroke Onset to Revascularization</b>	332 minutes	248 minutes (1 <sup>st</sup> deployment of stent)	248 minutes	355 minutes	241 minutes
<b>Symptomatic ICH</b>	7.8% vs 6.4% ns	0 vs 3% ns	0 vs 6% ns	1.9% vs 1.9%	3.6% vs 2.7% ns
<b>Mortality at 90 days</b>	21% vs. 22% ns	9% vs 12% ns	9% vs 20% ns	18.4% vs 15.5% ns	10% vs 19% ns

ESCAPE N Engl J Med 2015 372: 1019-1030  
 EXTEND-IA Study N Engl J Med 2015 372: 1009-1018  
 MR CLEAN N Engl J Med 2015 372: 11-20  
 SWIFT PRIME Study N Engl J Med 2015 372:2285-2295  
 REVASCAT N Engl J Med 2015 372: 2296-2306

# Five Randomized Prospective Trials Supporting Stent Thrombectomy for Large Vessel Acute Stroke: Inclusion Data

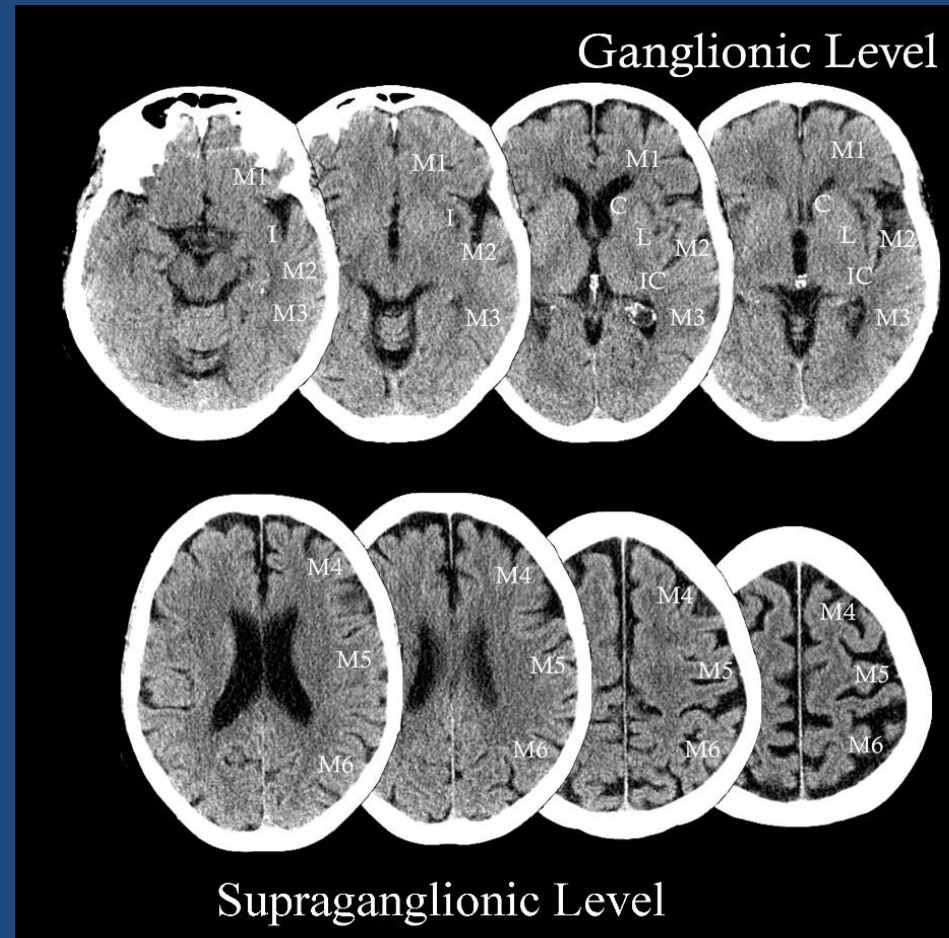
	MR CLEAN (Netherlands)	SWIFT PRIME (Global)	EXTEND IA (AUS, NZ)	REVASCAT (Spain)	ESCAPE (Global)
Confirmed Large Vessel Occlusion	Distal ICA, M1, M2, A1, A2	ICA, M1 or carotid T	ICA, M1, M2	ICA, M1, M2	ICA M1, M2
Inclusion NIHSS	NIHSS $\geq$ 2	Disabling stroke NIHSS >12	NIHSS > 8	NIHSS > 6	Disabling stroke NIHSS >11
Median NIHSS IV + Endo vs IV Alone	17 vs 18	17 vs 17	17 vs 13	17 vs 17	16 vs 17
Inclusion Imaging Criteria	CTA, MRA	Initially CT perfusion (RAPID) ASPECTS > 6	CT perfusion (RAPID) Ischemic core < 70ml	ASPECTS > 7	ASPECTS > 6

ESCAPE N Engl J Med 2015 372: 1019-1030  
 EXTEND-IA Study N Engl J Med 2015 372: 1009-1018  
 MR CLEAN N Engl J Med 2015 372: 11-20  
 SWIFT PRIME Study N Engl J Med 2015 372:2285-2295  
 REVASCAT N Engl J Med 2015 372: 2296-2306

# ASPECTS: Alberta Stroke Program Early CT Score

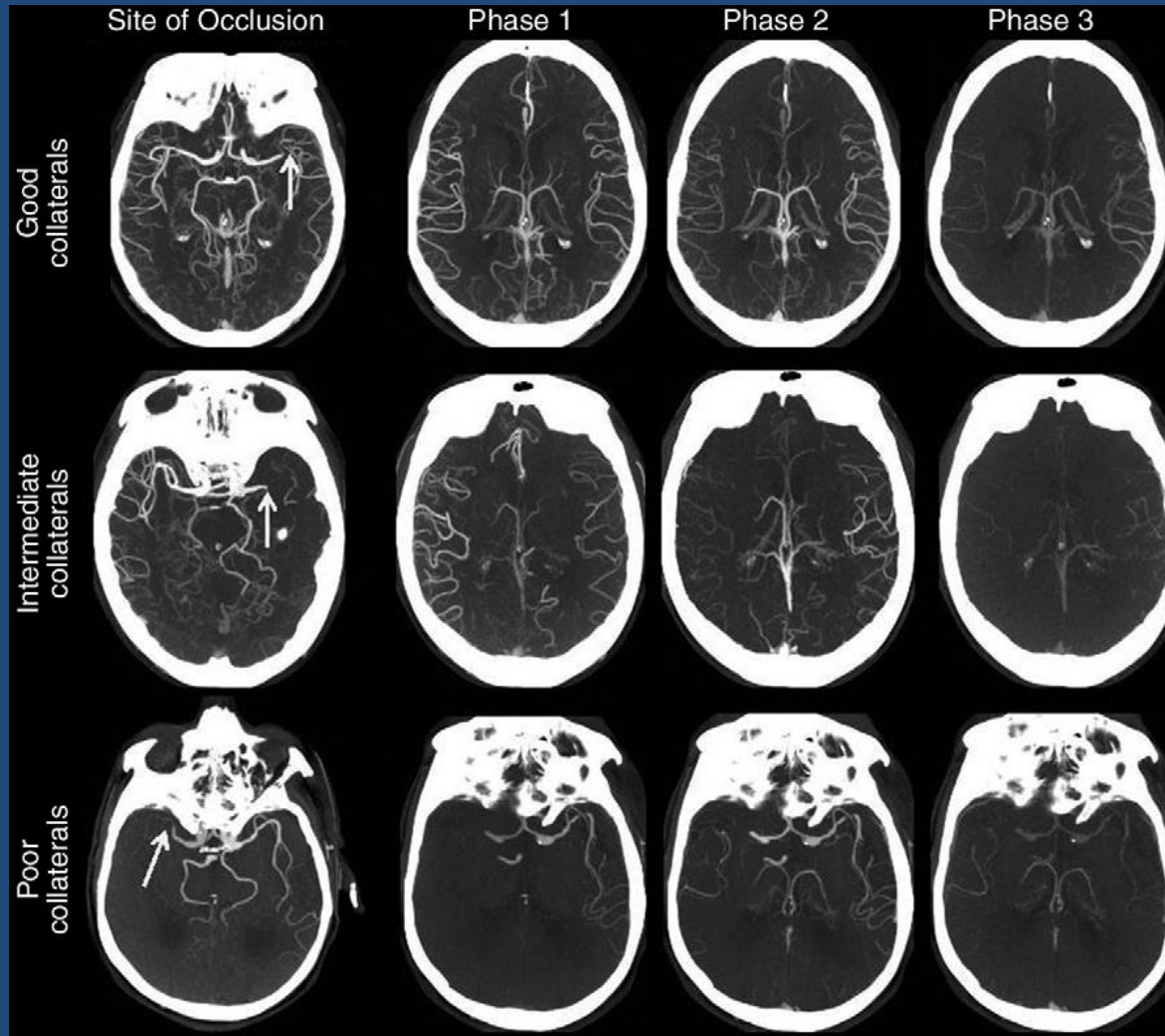
## 10 point scale

1. caudate
2. putamen
3. internal capsule\*
4. insular cortex
5. M1: "anterior MCA cortex," corresponding to frontal operculum
6. M2: "MCA cortex lateral to insular ribbon" corresponding to anterior temporal lobe
7. M3: "posterior MCA cortex" corresponding to posterior temporal lobe
8. M4: "anterior MCA territory immediately superior to M1"
9. M5: "lateral MCA territory immediately superior to M2"
10. M6: "posterior MCA territory immediately superior to M3"





# Multiphase CTA



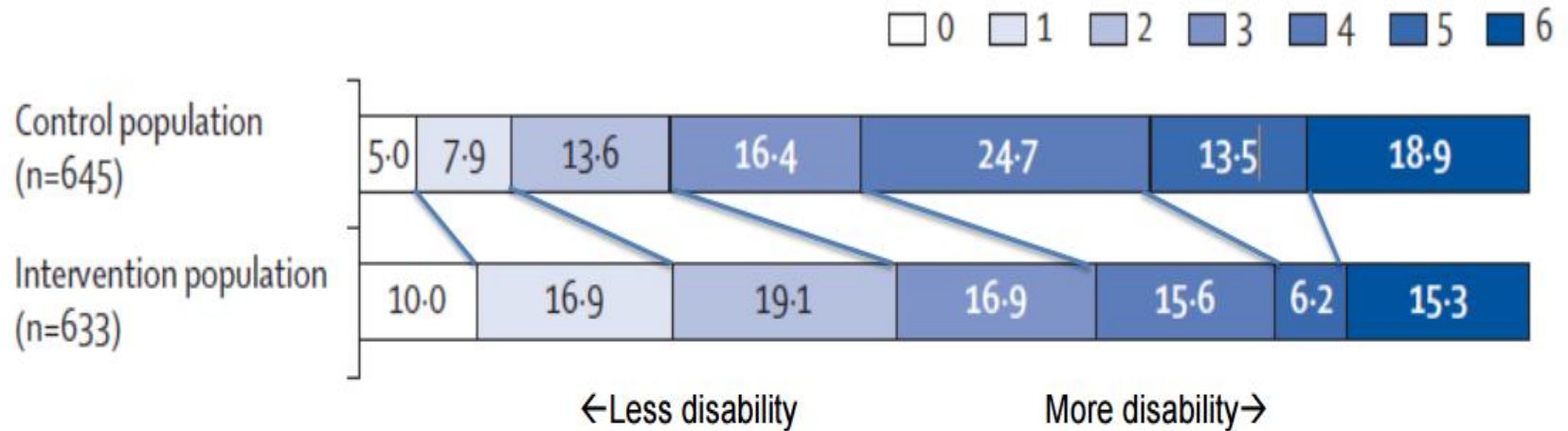
# Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials

*Mayank Goyal, Bijoy K Menon, Wim H van Zwam, Diederik W J Dippel, Peter J Mitchell, Andrew M Demchuk, Antoni Dávalos, Charles B L M Majoie, Aad van der Lugt, Maria A de Miquel, Geoffrey A Donnan, Yvo B W E M Roos, Alain Bonafe, Reza Jahan, Hans-Christoph Diener, Lucie A van den Berg, Elad I Levy, Olvert A Berkhemer, Vitor M Pereira, Jeremy Rempel, Mònica Millán, Stephen M Davis, Daniel Roy, John Thornton, Luis San Román, Marc Ribó, Debbie Beumer, Bruce Stouch, Scott Brown, Bruce C V Campbell, Robert J van Oostenbrugge, Jeffrey L Saver, Michael D Hill, Tudor G Jovin, for the HERMES collaborators*

Lancet 2016

- 71% RECANALIZATION RATE WITH STENT CLOT RETRIEVERS
- 2.5 MORE LIKELY TO BE INDEPENDENT AT 90 DAYS IN THE EVT group
- 2.6 PTS NEED TO BE TREATED TO REDUCE DISABILITY BY 1 POINT

# Benefit of Endovascular Treatment



- Pooled analysis of 1287 patients from 5 recent trials
- Functional independence (mRS 0-2) at 3 months, 46% vs 26%
- For every 100 patients treated with endovascular therapy
  - 38 patients will have less disabled outcome
  - Including 20 more functionally independent

# NNTs for Cerebral and Cardiac Ischemia Binary Outcomes

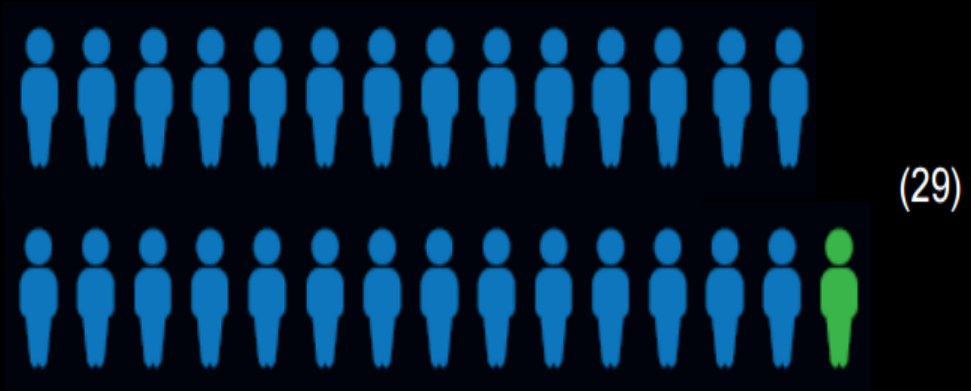
**Thrombectomy**  
for AIS (vs Lysis)  
Independence



**IV Lytics**  
for AIS (vs ASA)  
Nondisability



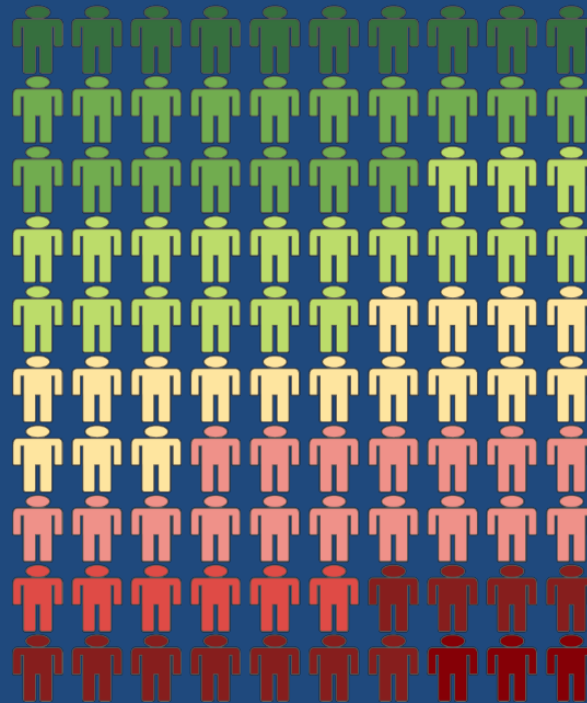
**PCI**  
for STEMI (vs Lysis)  
Mortality



Intravenous tPA Alone for Cerebral Ischemia  
(tPA-Eligible Patients)



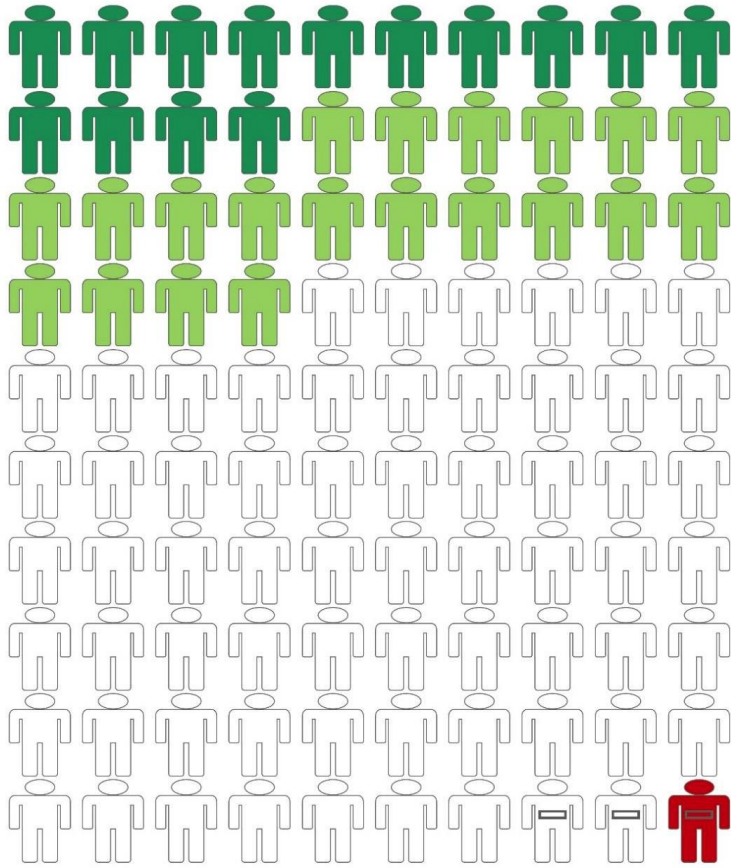
Thrombectomy added to tPA for Cerebral Ischemia in  
(tPA-Eligible Patients)



Visual Aids for Patient, Family, and Physician Decision Making About Endovascular Thrombectomy for Acute Ischemic Stroke, Tokunboh et al, Stroke 2018



## Thrombectomy Plus tPA vs tPA Alone (tPA-Eligible Patients)



Changes in final outcome as a result of treatment:

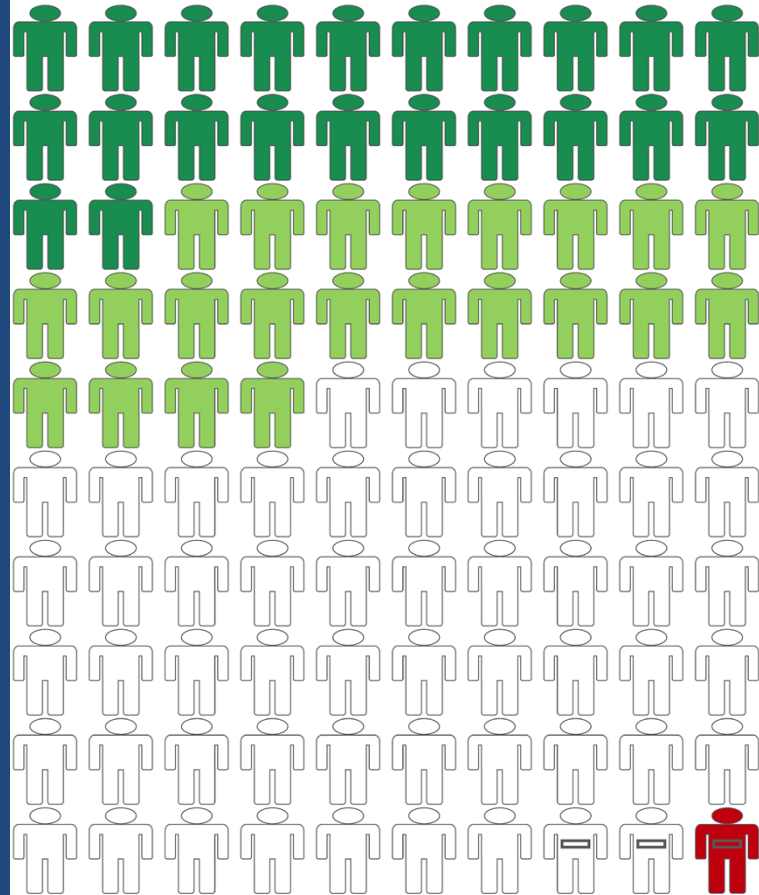
- Normal or nearly normal
- Other improvement
- No major change
- Other worsening
- Severely disabled or dead

Early course:

- New territory infarct
- Early worsening with brain bleeding (SICH)\*

(\*No difference in the rate of SICH due to thrombectomy)

## Thrombectomy vs No Reperfusion Therapy (tPA-Ineligible Patients)



Changes in final outcome as a result of treatment:

- Able to live independently
- Other improvement
- No major change
- Other worsening
- Severely disabled or dead

Early course:

- New territory infarct
- Early worsening with brain bleeding (SICH)\*

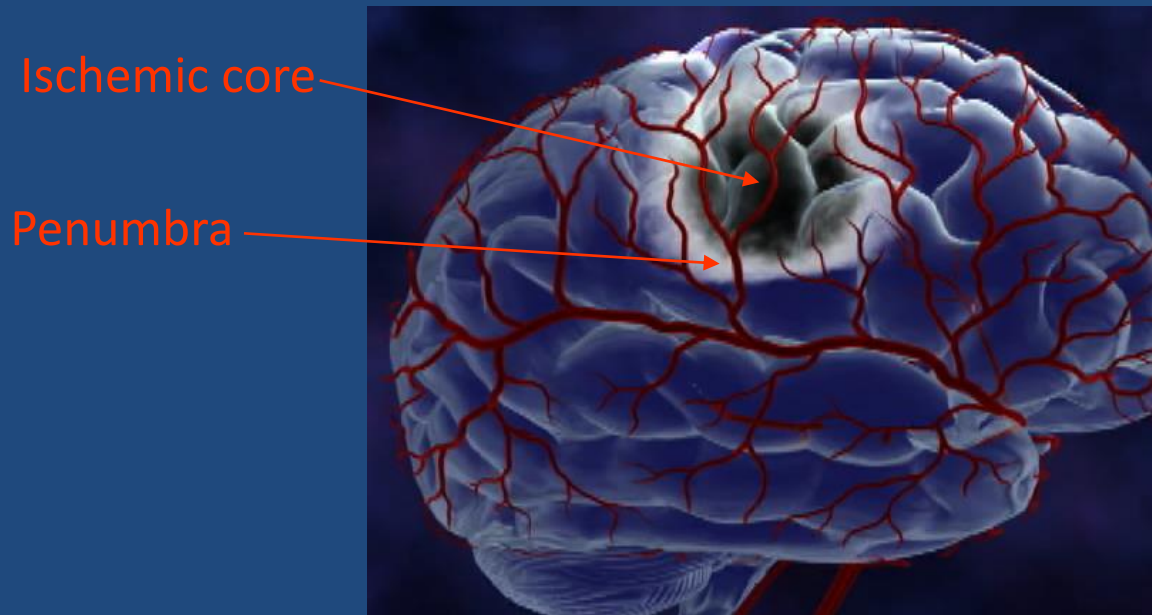
(\*No differences observed in the rate of SICH due to thrombectomy)

**Table 3.** Procedure-related events

	SWIFT PRIME	MR CLEAN	ESCAPE	Extend IA	REVASCAT
Device used	Solitaire FR (flow restoration) Solitaire 2 device	Trevo Pro solitaire FR	Solitaire stent	Solitaire FR (flow restoration)	Solitaire device (solitaire FR)
Device used in trial	89%	81.5 %	86.7%	77.1%	95.1%
Embolization into another vessel territory	n.a.	8.6%	4.9%	5.7%	4.9%
Arterial perforation	n.a.	0.9%	0.6	2.9%	4.9
Arterial dissection	n.a.	1.7%	0.6		3.9
Access site hematoma	n.a.	n.a.	7.2	2.9%	10.7
General anesthesia	37%	37.8%	9.1%	36%	6.8%

# The Penumbra

- Surrounding this ischemic core is an area of reduced blood flow called the ischemic penumbra<sup>1</sup>
- The penumbra's cells receive suboptimal blood flow (<40%)<sup>2</sup>



# TIME IS BRAIN

43% of pts mRS 0-1 if reperfused in 2hrs  
23% if reperfused at 8 hrs

No interaction of reperfusion time and ICH or  
mortality

# Time to reperfusion

- Functional independence rate 64% at 3hrs
- 46% at 8hrs
- Benefit nonsignificant after 7.3 hrs

*Time to Treatment with endovascular thrombectomy and outcomes from ischemic stroke: A Meta-analysis*

*Saver et al, JAMA 2016*

# Time to endovascular reperfusion and degree of disability in acute stroke

- Every 5 min delay in endovascular reperfusion, 1 of 100 pts has a worse disability outcome
- For every 15 minute acceleration 34 of 1000 pts had improved disability level

*Sheth, SA et al, Annals of Neurology, 78(4) 584-593*



# ACUTE STROKE GUIDELINES 2015

- AHA
- EUROPEAN CONSENSUS (ESO+ESMINT+ESNR)

# 2015 American Heart Association/American Stroke Association Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment

Patients should receive endovascular therapy with a stent retriever if they meet all the following criteria

*(Class I; Level of Evidence A).*

1. Pre-stroke mRS score 0 to 1
2. Acute ischemic stroke receiving intravenous r-tPA within 4.5 hours of onset according to guidelines from professional medical societies
3. Causative occlusion of the ICA or proximal MCA
4. Age  $\geq 18$  years,
5. NIHSS score of  $\geq 6$ ,
6. ASPECTS of  $\geq 6$ , and
7. Treatment can be initiated (groin puncture) within 6 hours of symptom onset

# GUIDELINES for ICA,MCA (M1,M2/M3) occlusions

- Mechanical Thrombectomy within 4.5 h in addition to IVT
- Mechanical Thrombectomy alone 4.5-6hrs
- Mechanical Thrombectomy first line treatment if IVT contraindicated

# Basilar artery occlusion

- MT in addition to EVT but low level of evidence

# Recommendations

- IVT should not delay Mechanical Thrombectomy(MT)
- MT should nor prevent IVT

ORIGINAL ARTICLE

## Thrombectomy 6 to 24 Hours after Stroke with a Mismatch between Deficit and Infarct

R.G. Nogueira, A.P. Jadhav, D.C. Haussen, A. Bonafe, R.F. Budzik, P. Bhuva, D.R. Yavagal, M. Ribo, C. Cognard, R.A. Hanel, C.A. Sila, A.E. Hassan, M. Millan, E.I. Levy, P. Mitchell, M. Chen, J.D. English, Q.A. Shah, F.L. Silver, V.M. Pereira, B.P. Mehta, B.W. Baxter, M.G. Abraham, P. Cardona, E. Veznedaroglu, F.R. Hellinger, L. Feng, J.F. Kirmani, D.K. Lopes, B.T. Jankowitz, M.R. Frankel, V. Costalat, N.A. Vora, A.J. Yoo, A.M. Malik, A.J. Furlan, M. Rubiera, A. Aghaebrahim, J.-M. Olivot, W.G. Tekle, R. Shields, T. Graves, R.J. Lewis, W.S. Smith, D.S. Liebeskind, J.L. Saver, and T.G. Jovin, for the DAWN Trial Investigators\*

# DAWN TRIAL NEJM 2017

Diffusion weighted Imaging(DWI) or CT  
Perfusion(CTP)Assessment with Clinical Mismatch in the  
Triage of Wake –Up and Late Presenting Strokes  
Undergoing Neurointervention



# DAWN TRIAL NEJM 2017

- Potentially salvagable tissue defined by a mismatch between clinical assessment and Imaging (infarct core volume)

# DAWN TRIAL NEJM 2017

- A.  $\geq 80$ , NIHSS  $\geq 10$  and core  $< 21$ cc
- B.  $< 80$ , 1. NIHSS  $\geq 10$  and core  $< 31$ cc  
2. NIHSS  $\geq 20$  and core  $< 51$ cc
- 206 patients randomized
- Occlusion site: Intracranial ICA or M1

# DAWN TRIAL NEJM 2017

**Table 1. Characteristics of the Patients at Baseline.\***

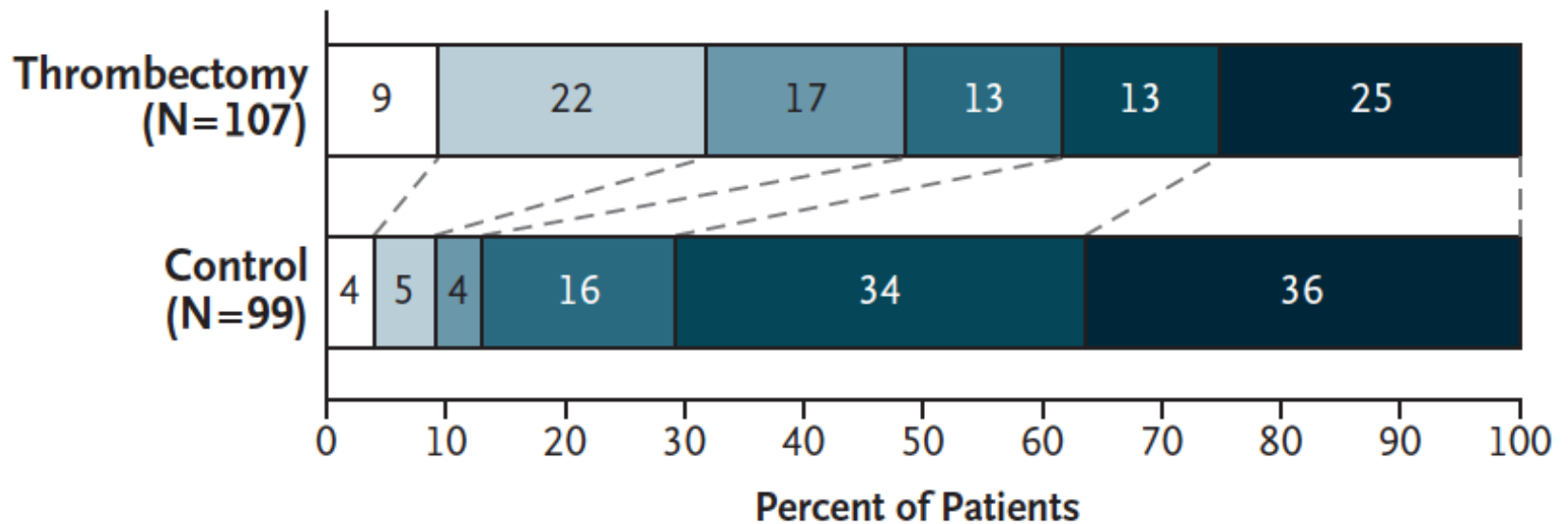
Variable	Thrombectomy Group (N= 107)	Control Group (N= 99)
Age — yr	69.4±14.1	70.7±13.2
Age ≥80 yr — no. (%)	25 (23)	29 (29)
Male sex — no. (%)	42 (39)	51 (52)
Atrial fibrillation — no. (%)	43 (40)	24 (24)
Diabetes mellitus — no. (%)	26 (24)	31 (31)
Hypertension — no. (%)	83 (78)	75 (76)
Previous ischemic stroke or transient ischemic attack — no. (%)	12 (11)	11 (11)
NIHSS score <sup>†</sup>		
Median	17	17
Interquartile range	13–21	14–21
10 to 20 — no. (%)	78 (73)	72 (73)
Treatment with intravenous alteplase — no. (%)	5 (5)	13 (13)
Infarct volume — ml		
Median	7.6	8.9
Interquartile range	2.0–18.0	3.0–18.1
Type of stroke onset — no. (%) <sup>‡</sup>		
On awakening	67 (63)	47 (47)
Unwitnessed stroke	29 (27)	38 (38)
Witnessed stroke	11 (10)	14 (14)
Occlusion site — no. (%) <sup>§</sup>		
Intracranial internal carotid artery	22 (21)	19 (19)
First segment of middle cerebral artery	83 (78)	77 (78)
Second segment of middle cerebral artery	2 (2)	3 (3)
Interval between time that patient was last known to be well and randomization — hr		
Median	12.2	13.3
Interquartile range	10.2–16.3	9.4–15.8
Range	6.1–23.5	6.5–23.9
Time from first observation of symptoms to randomization — hr		
Median	4.8	5.6
Interquartile range	3.6–6.2	3.6–7.8

# DAWN TRIAL RESULTS

## Score on the Modified Rankin Scale

□ 0   □ 1   □ 2   □ 3   □ 4   □ 5 or 6

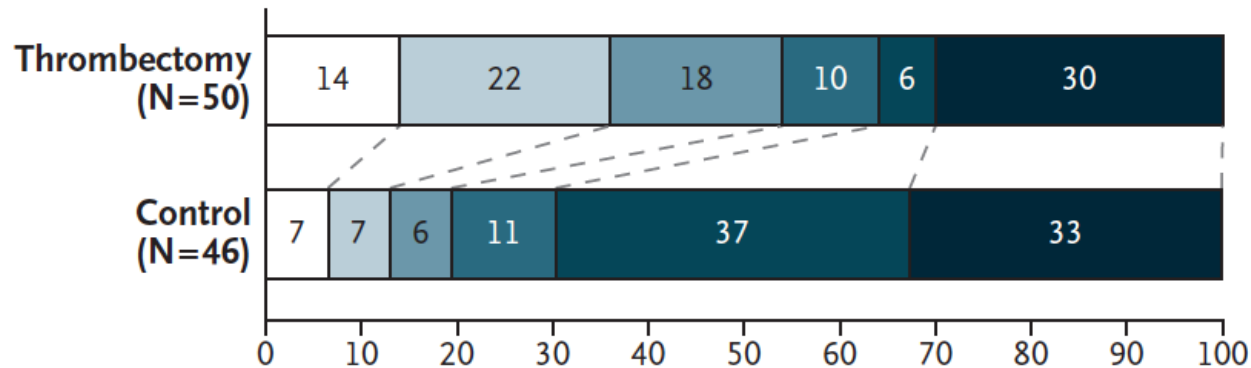
### A Intention-to-Treat Population



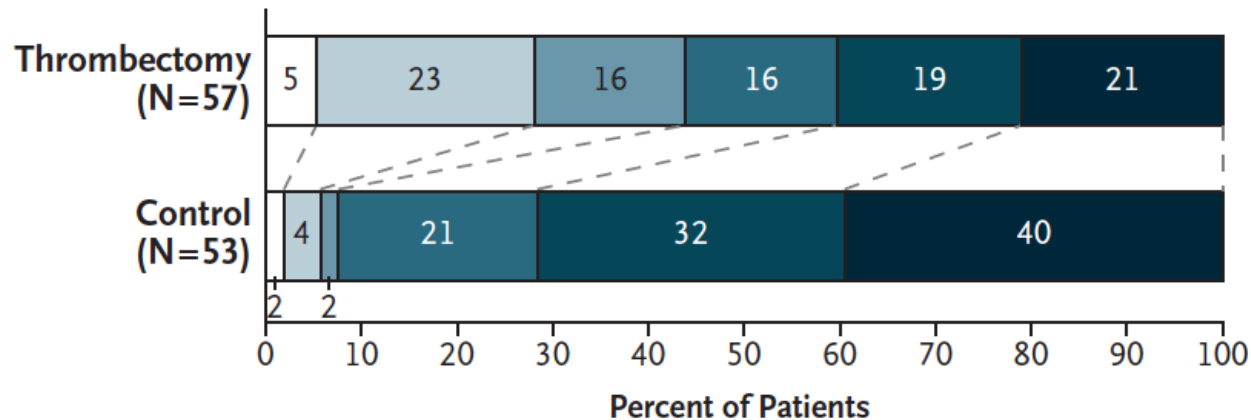
# DAWN TRIAL RESULTS

## B Subgroups According to Time of Stroke Onset

Last Known to Be Well 6 to 12 Hr before Randomization



Last Known to Be Well >12 to 24 Hr before Randomization



Score on the Modified Rankin Scale



# DAWN TRIAL RESULTS

- Για κάθε 2.8 ασθενείς που υποβάλλονται σε θρομβεκτομή 1 επιπλέον ασθενής καθίσταται λειτουργικά ανεξάρτητος στις 90 ημέρες μετά το ΑΕΕ.

# DAWN ΣΥΜΠΕΡΑΣΜΑΤΑ

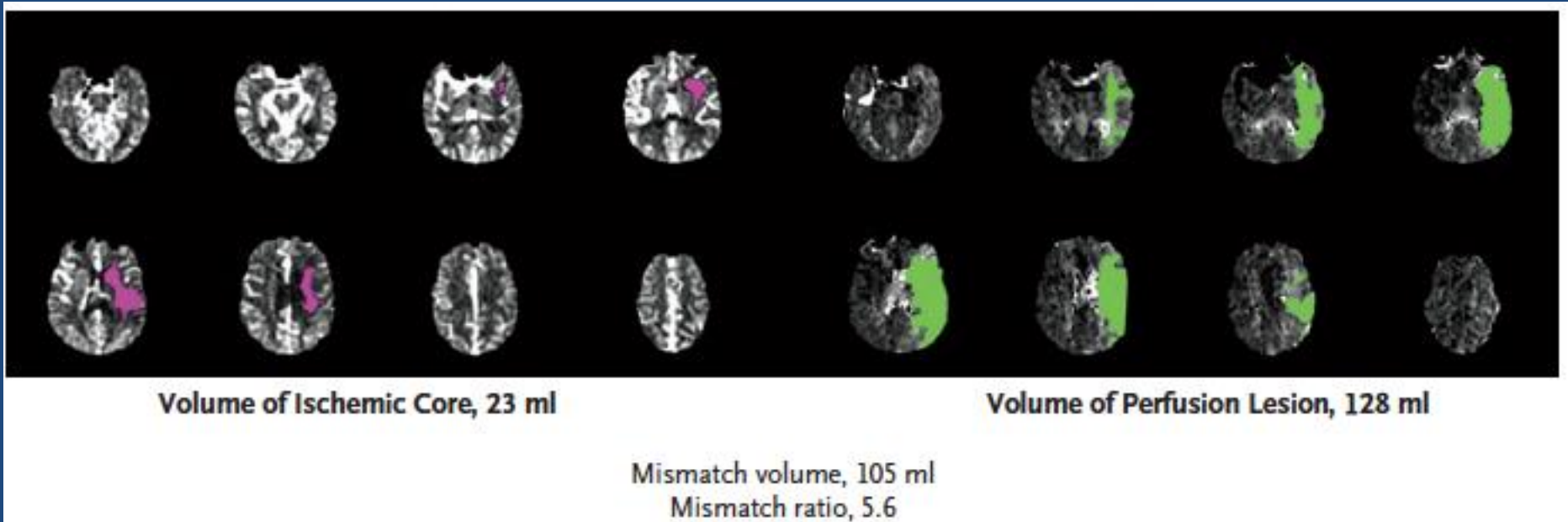
- Το κλινικό όφελος είναι σημαντικό 6-12 ώρες και 12-24 ώρες, περίπου στο 50% των ασθενών. Το κλινικό αποτέλεσμα είναι καλύτερο για τους ασθενείς που αντιμετωπίζονται νωρίτερα στην ομάδα της θρομβεκτομής και στο control group.
- Το ποσοστό των ασθενών που κερδίζουν από τη θρομβεκτομή στη DAWN είναι αντίστοιχο με αυτό των ασθενών που κάνουν βασικό απεικονιστικό έλεγχο στις 2 ώρες.



# DEFUSE 3 TRIAL NEJM 2018

Thrombectomy for Stroke at 6 to 16  
Hours  
with Selection by Perfusion Imaging

# DEFUSE 3 TRIAL PATIENT SELECTION



# DEFUSE 3 TRIAL

- RAPID Target mismatch with core up to 70 ml and
- ICA(cervical or intracranial) and/ or M1 occlusion
- 182 patients randomized
- 62% pts of DEFUSE 3 DAWN eligible

# DEFUSE 3 TRIAL

**Table 1.** Baseline Characteristics of the Patients and Features of Thrombectomy.\*

Characteristic	Endovascular Therapy (N=92)	Medical Therapy (N=90)
Median age (IQR) — yr	70 (59–79)	71 (59–80)
Female sex — no. (%)	46 (50)	46 (51)
Median NIHSS score (IQR)†	16 (10–20)	16 (12–21)
Stroke onset witnessed — no. (%)		
Yes‡	31 (34)	35 (39)
No		
Symptoms were present on awakening	49 (53)	42 (47)
Symptoms began during wakefulness	12 (13)	13 (14)
Treatment with intravenous t-PA — no. (%)§	10 (11)	8 (9)
Imaging characteristics¶		
Qualifying imaging — no. (%)		
CT perfusion imaging	69 (75)	64 (71)
Diffusion and perfusion MRI	23 (25)	26 (29)
Median volume of ischemic core (IQR) — ml	9.4 (2.3–25.6)	10.1 (2.1–24.3)
Median volume of perfusion lesion (IQR) — ml	114.7 (79.3–146.3)	116.1 (73.4–158.2)
Occlusion site on baseline CTA or MRA — no. (%)		
Internal carotid artery	32 (35)	36 (40)
Middle cerebral artery**	60 (65)	54 (60)
Median ASPECTS on baseline CT (IQR)††	8 (7–9)	8 (7–9)
Process measures — hr:min		
Median time from stroke onset to qualifying imaging (IQR)	10:29 (8:09–11:40)	9:55 (7:59–12:20)
Median time from stroke onset to randomization (IQR)	10:53 (8:46–12:21)	10:44 (8:42–13:04)
Median time from qualifying imaging to femoral puncture (IQR)	0:59 (0:39–1:27)	NA
Median time from femoral puncture to reperfusion (IQR)	0:38 (0:26–0:59)	NA

# DEFUSE 3 TRIAL

Treatment effect mRS shift, OR (95% CI)

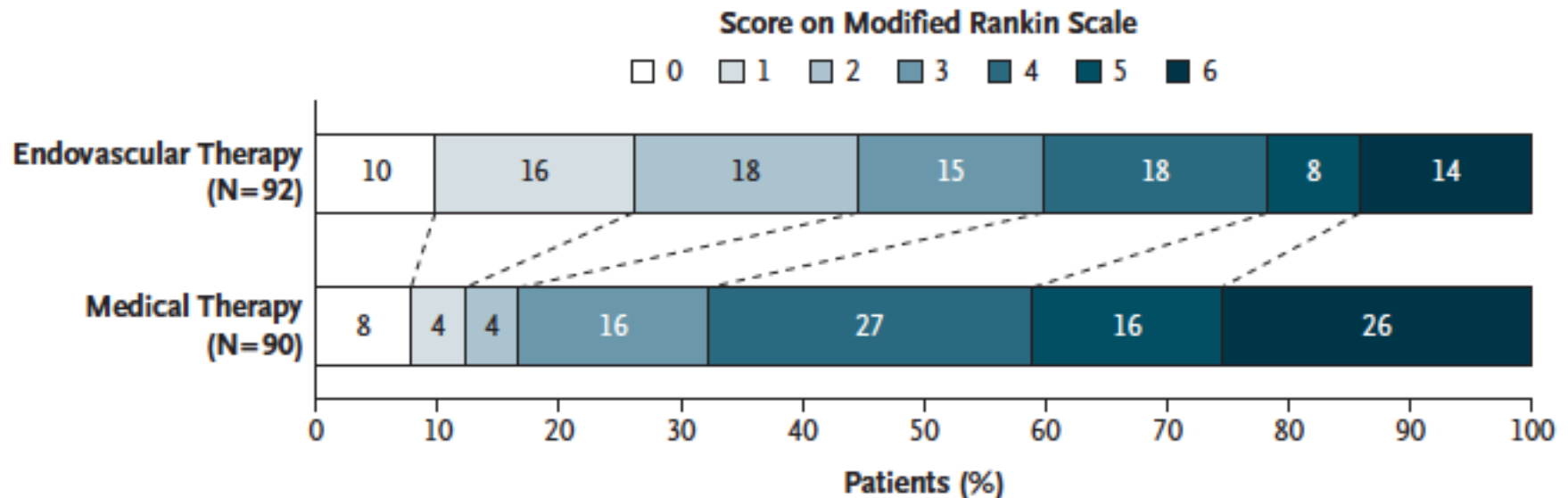
- DAWN eligible 2.7
- DAWN ineligible 3.0

# DEFUSE 3 TRIAL

	EVT	MEDICAL	P -value
Symptomatic ICH	6.5%	4.4%	0.75
Death	14%	26%	0.05

# DEFUSE 3 TRIAL RESULTS

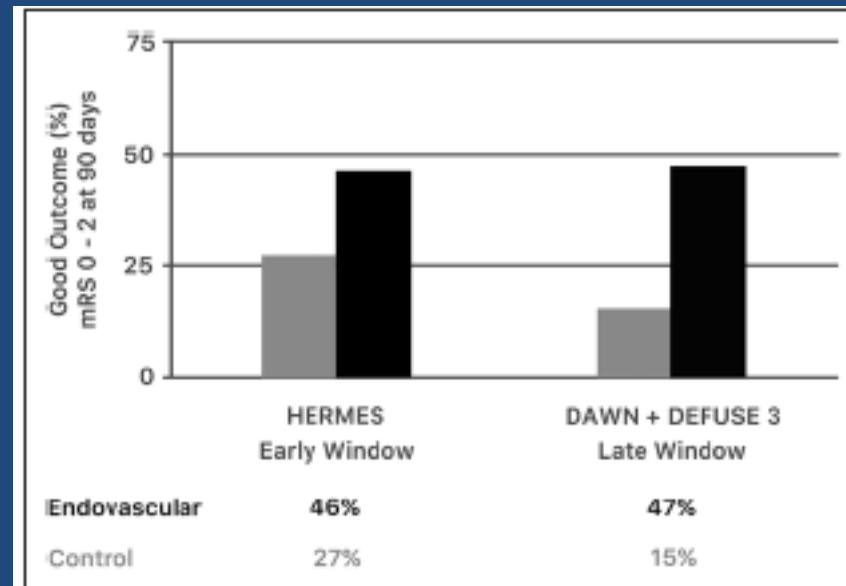
- ODDS RATIO FOR FAVORABLE SHIFT in mRS 2.77



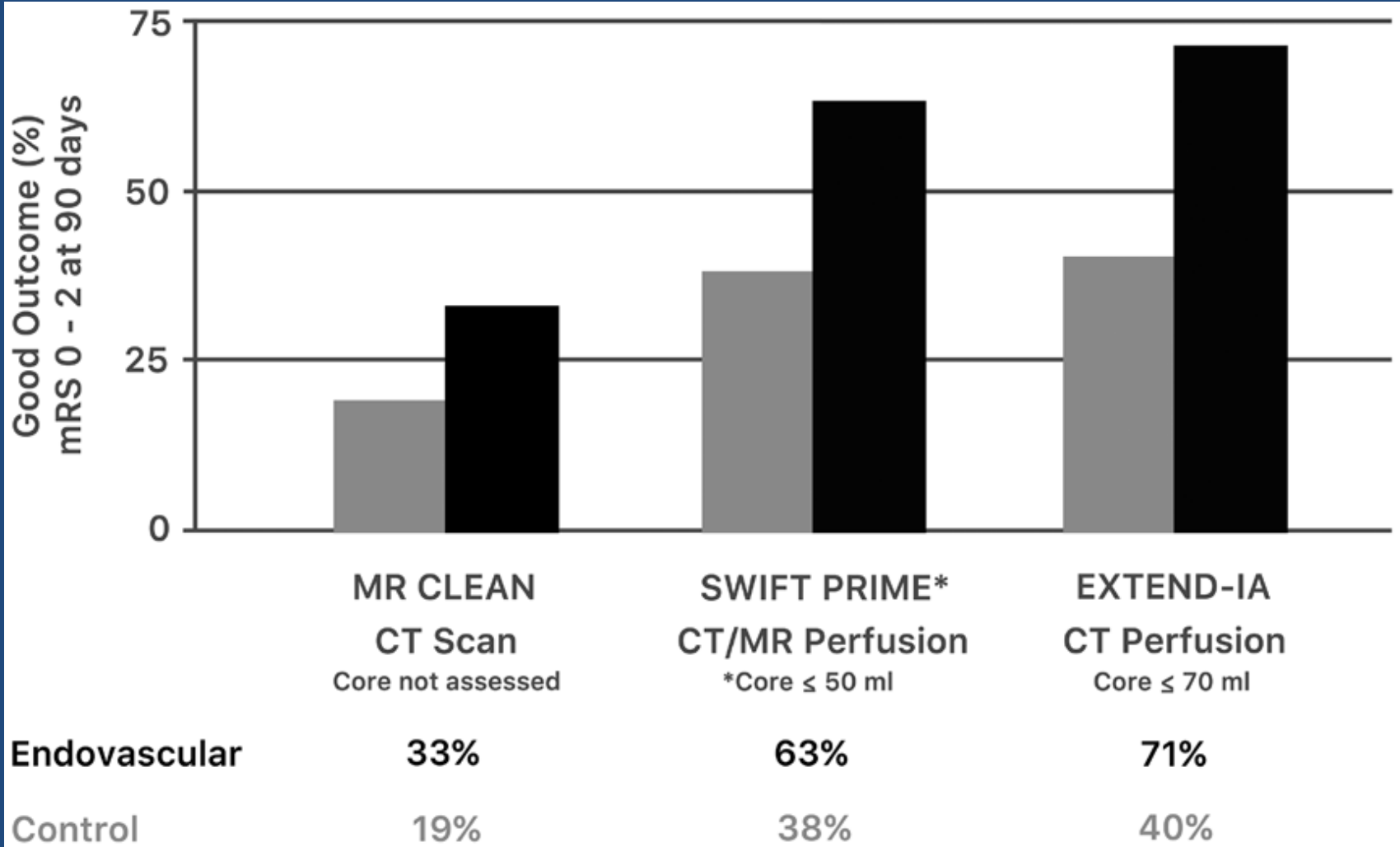
**mRS0-2: 45% vs 17%**



# Favorable outcome rates in early vs late window thrombectomy trials

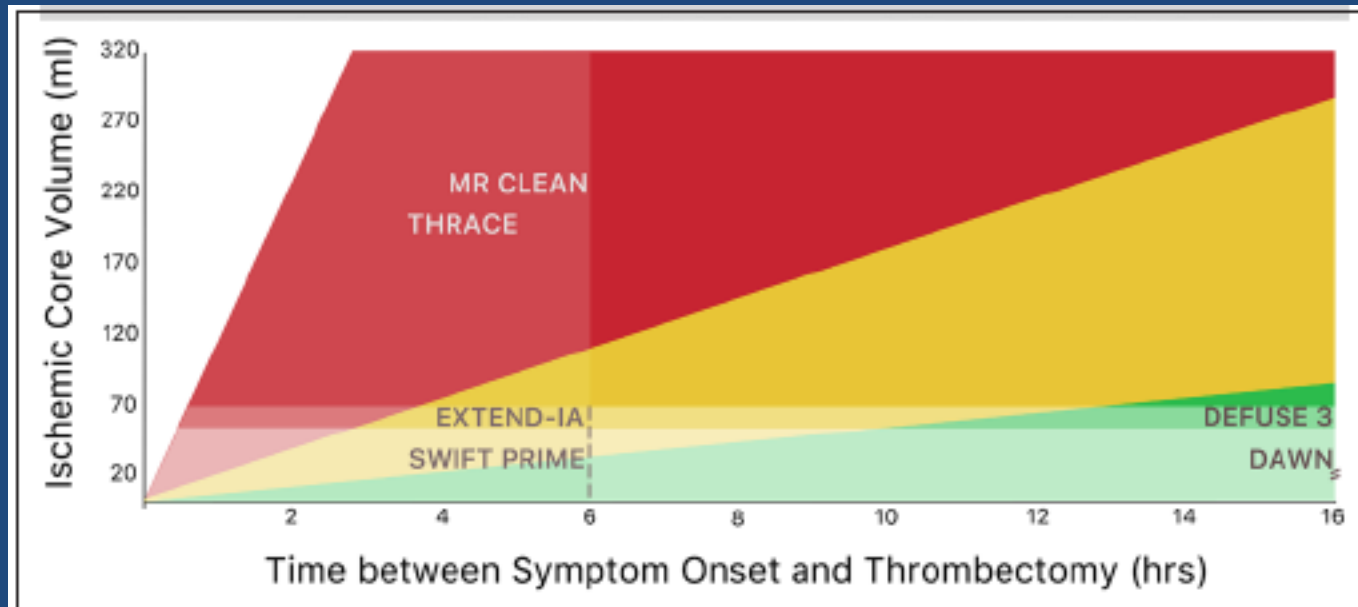


Albers, G Late Window Paradox, Stroke 2018



# Estimated infarct growth rates

Albers G, Late window Paradox, Stroke 2018



**2018 Guidelines for the Early Management of Patients  
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**A Guideline for Healthcare Professionals From the American Heart  
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**Patients should receive mechanical thrombectomy with a stent retriever if they meet all the following criteria: (1) prestroke mRS score of 0 to 1; (2) causative occlusion of the internal carotid artery or MCA segment 1 (M1); (3) age  $\geq 18$  years; (4) NIHSS score of  $\geq 6$ ; (5) ASPECTS of  $\geq 6$ ; and (6) treatment can be initiated (groin puncture) within 6 hours of symptom onset.**

I

A

**7. In selected patients with AIS within 6 to 16 hours of last known normal who have LVO in the anterior circulation and meet other DAWN or DEFUSE 3 eligibility criteria, mechanical thrombectomy is recommended.**

I

A

**8. In selected patients with AIS within 6 to 24 hours of last known normal who have LVO in the anterior circulation and meet other DAWN eligibility criteria, mechanical thrombectomy is reasonable.**

Ila

B-R

# Distal occlusions

Although the benefits are uncertain, the use of mechanical thrombectomy with stent retrievers may be reasonable for carefully selected patients with AIS in whom treatment can be initiated (groin puncture) within 6 hours of symptom onset and who have causative occlusion of the MCA segment 2 (M2) or MCA segment 3 (M3) portion of the MCAs.

IIb

B-R

**In patients under consideration for mechanical thrombectomy, observation after IV alteplase to assess for clinical response should not be performed.**

**III: Harm**

**B-R**

Recommendation revised from 2015 Endovascular.



# Συστάσεις Απεικόνισης

Multimodal CT and MRI, including perfusion imaging, should not delay administration of IV alteplase.

III: Harm

B-NR

Additional imaging beyond CT and CTA or MRI and magnetic resonance angiography (MRA) such as perfusion studies for selecting patients for mechanical thrombectomy in <6 hours is not recommended.

III: No Benefit

B-R

In selected patients with AIS within 6 to 24 hours of last known normal who have LVO in the anterior circulation, obtaining CTP, DW-MRI, or MRI perfusion is recommended to aid in patient selection for mechanical thrombectomy, but only when imaging and other eligibility criteria from RCTs showing benefit are being strictly applied in selecting patients for mechanical thrombectomy.

I

A

It may be reasonable to incorporate collateral flow status into clinical decision making in some candidates to determine eligibility for mechanical thrombectomy.

IIb

C-LD

Recommendation revised from 2015 Endovascular.

# ΣΥΜΠΕΡΑΣΜΑΤΑ

- Η ενδοαρτηριακή θεραπεία του οξέος ΑΕΕ υπερέχει της συντηρητικής θεραπείας σε σωστά επιλεγμένους ασθενείς με απόφραξη μεγάλου ενδοκράνιου αγγείου στις πρώτες 6 ώρες.
- Σημαντικό όφελος και από 6-24 ώρες μετά την έναρξη των συμπτωμάτων σε σωστά επιλεγμένους ασθενείς.
- Physiology is brain – Ανάδειξη παρεγχύματος που ισχαιμεί αλλά δεν έχει ακόμα νεκρωθεί με εξελιγμένες απεικονιστικές τεχνικές και συσχετισμός με κλινικό νευρολογικό έλλειμμα.
- Time is brain







# DAWN TRIAL NEJM 2017

Diffusion weighted Imaging(DWI) or CT  
Perfusion(CTP)Assessment with Clinical Mismatch in the  
Triage of Wake –Up and Late Presenting Strokes  
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? Πρέπει να αντιμετωπίζονται παρεμβατικά ασθενείς με ΑΕΕ και άγνωστη ώρα έναρξης συμπτωματολογίας

# DAWN TRIAL NEJM 2017

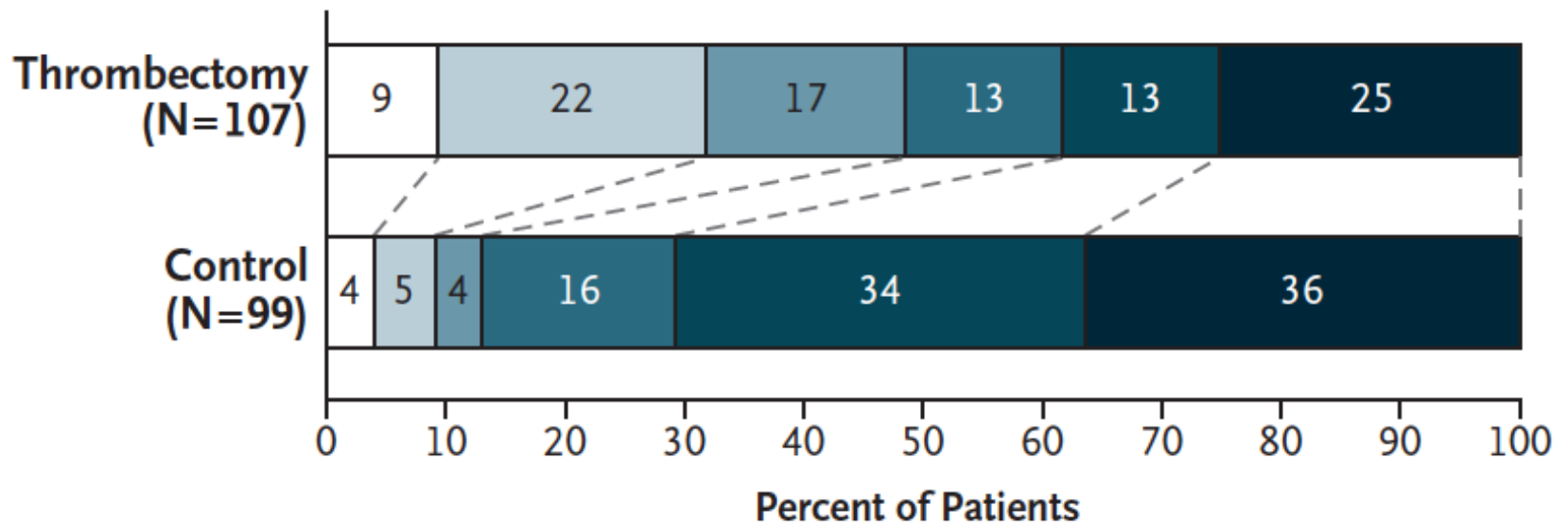
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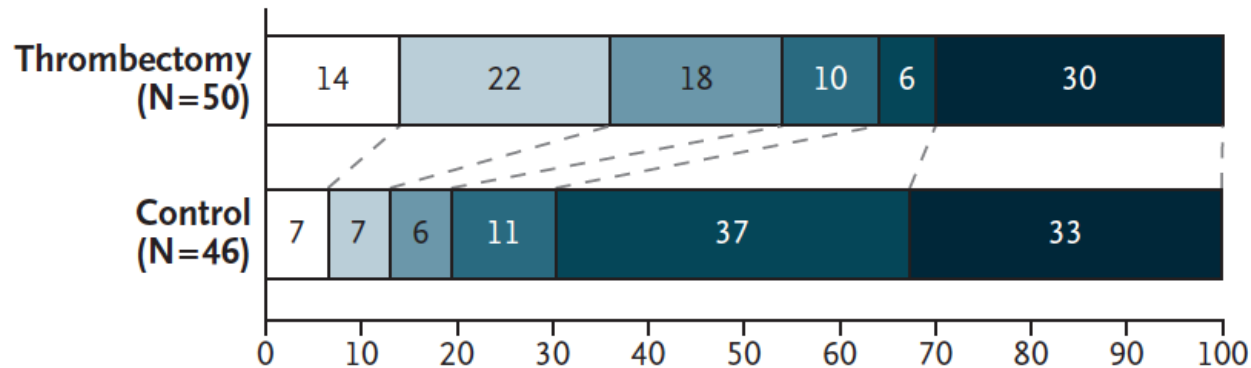




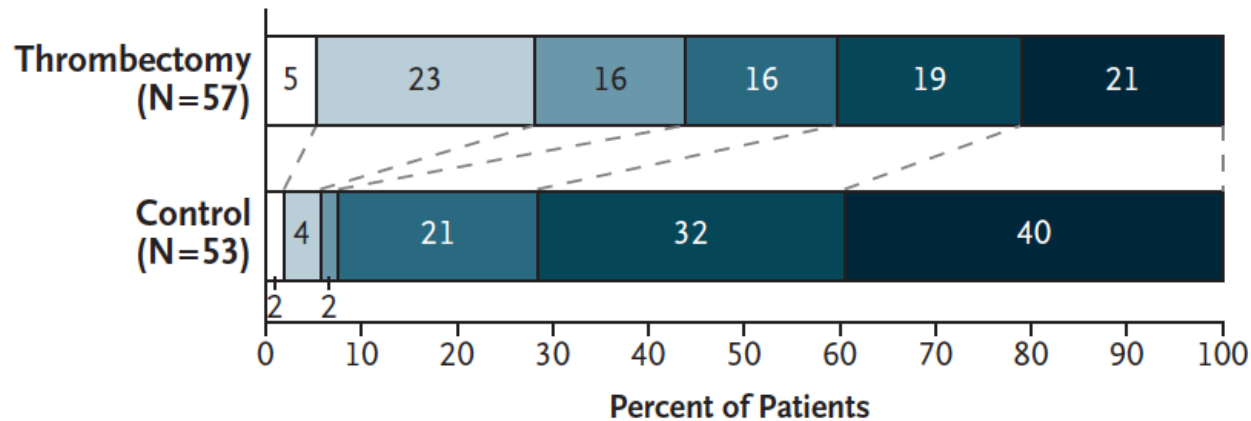
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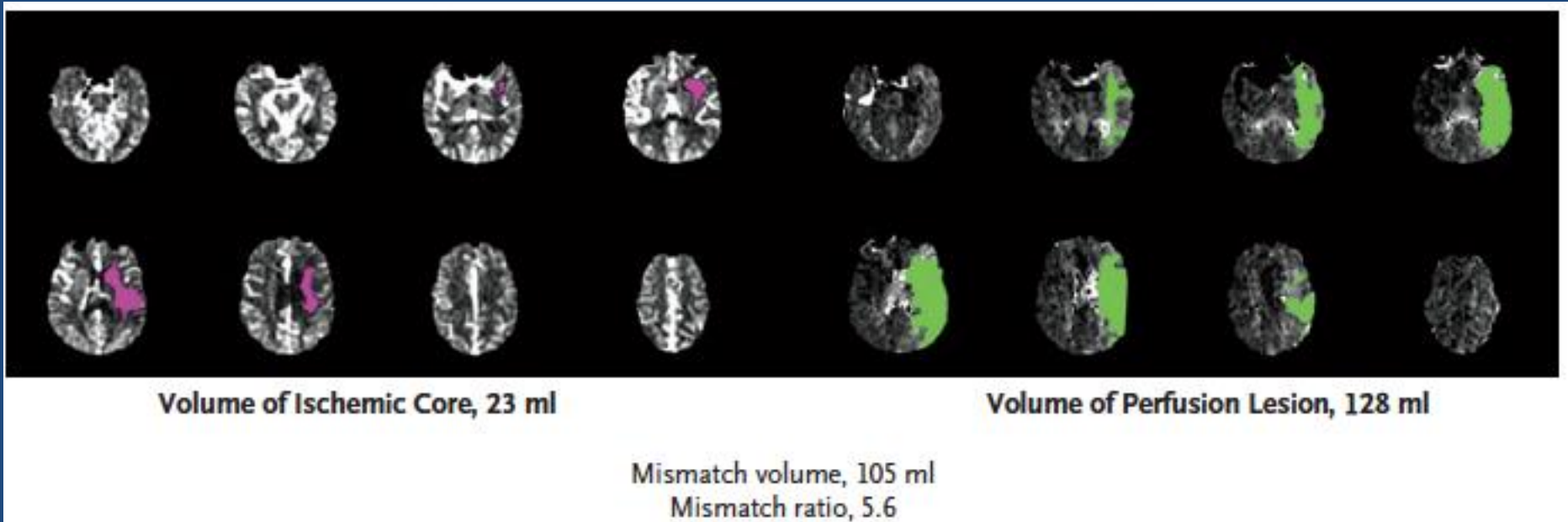
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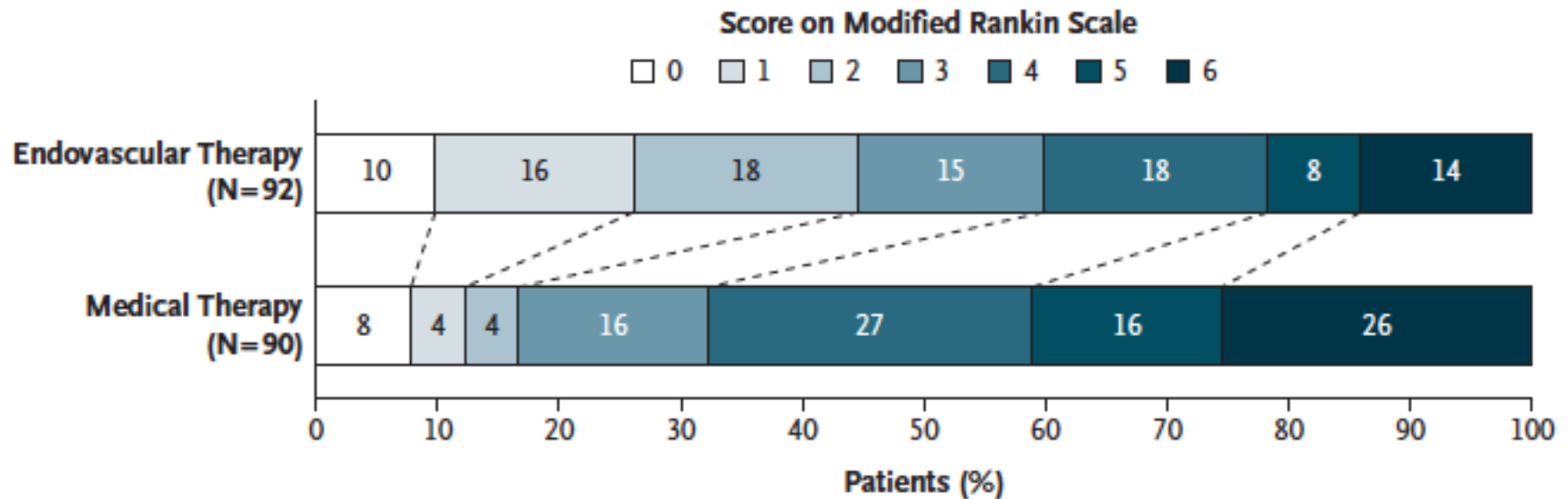
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**IIb**

**B-R**



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