ΑΝΕΥΡΥΣΜΑΤΑ, AVM ΚΑΙ ΙΣΧΑΙΜΙΚΟ ΕΠΕΙΣΟΔΙΟ ΕΓΚΕΦΑΛΟΥ

ΣΥΓΧΡΟΝΗ ΘΕΡΑΠΕΥΤΙΚΗ ΑΝΤΙΜΕΤΩΠΙΣΗ

Π.ΖΑΜΠΑΚΗΣ *PhD, MSc*
ΚΑΘΗΓΗΤΗΣ ΕΠΕΜΒΑΤΙΚΗΣ ΝΕΥΡΟΑΚΤΙΝΟΛΟΓΙΑΣ

ΠΑΝΕΠΙΣΤΗΜΙΑΚΟ ΝΟΣΟΚΟΜΕΙΟ ΠΑΤΡΩΝ

ΚΛΙΝΙΚΟ ΕΡΓΑΣΤΗΡΙΟ ΑΚΤΙΝΟΛΟΓΙΑΣ

ΚΛΙΝΙΚΑ ΑΠΟΤΕΛΕΣΜΑΤΑ ΑΝΕΥΡΥΣΜΑΤΙΚΗΣ ΑΙΤΙΟΛΟΓΙΑΣ ΥΠΑΡΑΧΝΟΕΙΔΟΥΣ ΑΙΜΟΡΡΑΓΙΑΣ

- 45% - 50% θνητότητα στις 30 πρώτες ημέρες
- **75% θνητότητα σε κωματώδεις ασθενείς**
- 1/3 των ασθενών που επιβιώνουν έχουν νευρολογικό έλλειμμα
- Κίνδυνος επαναιμορραγίας:
  - 3%-4% τις πρώτες 24 ώρες
  - 1%-2%/ημέρα για τον πρώτο μήνα
  - 3% ετησίως μετά τους 3 μήνες
- Θνητότητα από επαναιμορραγία είναι ~70%

Bederson JB, et.al. Guidelines for the management of aneurysmal subarachnoid hemorrhage: a statement for healthcare professionals from a special writing group of the Stroke Council, American Heart Association. Stroke 2009;40:994-1025

ΑΝΕΥΡΥΣΜΑΤΑ ΚΑΙ ΑΠΕΙΚΟΝΙΣΗ

Radiology. 2012 Feb;262(2):605-12. Epub 2011 Dec 5.

Digital subtraction CT angiography for detection of intracranial aneurysms: comparison with three-dimensional digital subtraction angiography.

Lu L, Zhang LJ, Poon CS, Wu SY, Zhou CS, Luo S, Wang M, Lu GM.

Department of Medical Imaging, Jinling Hospital, Clinical School of Medical College, Nanjing University, Nanjing, Jiangsu 210002, China.

Abstract

PURPOSE: To evaluate the diagnostic accuracy of digital subtraction computed tomographic (CT) angiography in the detection of intracranial aneurysms compared with three-dimensional (3D) rotational digital subtraction angiography (DSA), as reference standard, in a large cohort in a single center.

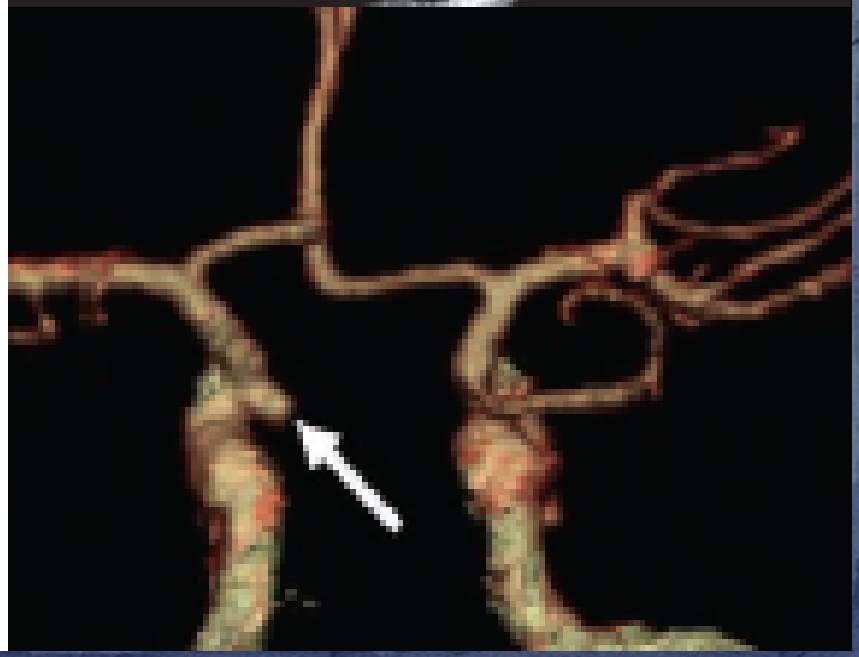
MATERIALS AND METHODS: The study was waived by the institutional review board because of its retrospective nature. A total of 513 patients clinically suspected of having or with known intracranial aneurysms and other cerebral vascular diseases underwent both digital subtraction CT angiography with a dual-source CT scanner and 3D DSA, with a median interval of 1 day; 436 patients (84.9%) had acute subarachnoid hemorrhage at presentation. The sensitivity, specificity, and accuracy of digital subtraction CT angiography in depicting aneurysm were analyzed on a per-patient and per-aneurysm basis, with 3D DSA as the reference standard. The sensitivity, specificity, and accuracy of digital subtraction CT angiography in depicting aneurysms of different diameter (ie, <3 mm, 3-5 mm, 5-10 mm, and >10 mm) and of aneurysms at different locations in the anterior and posterior circulation were calculated. Kappa statistics were calculated to quantify inter- and intrareader variability in detecting aneurysms by using digital subtraction CT angiography for 100 patients.

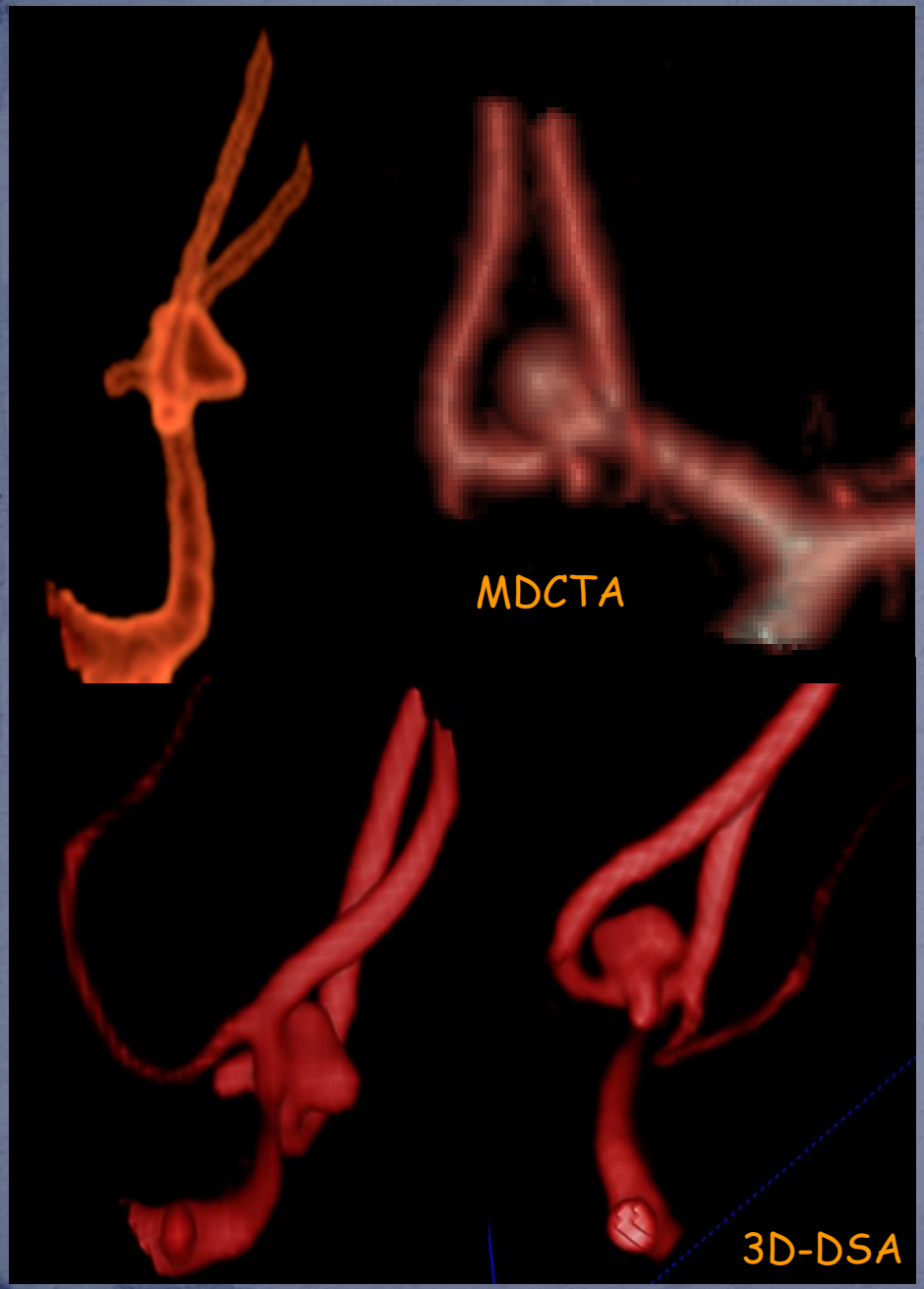
RESULTS: Of 513 patients, 106 (20.7%) had no aneurysms, while 407 patients (79.3%) had 459 aneurysms at 3D DSA. Digital subtraction CT angiography correctly depicted 456 (99.3%) of the 459 aneurysms. By using 3D DSA as the standard of reference, the sensitivity and specificity of depicting intracranial aneurysms were 97.8% (398 of 407) and 88.7% (94 of 106), respectively, on a per-patient basis, and 96.5% (443 of 459) and 87.8% (94 of 107), respectively, on a per-aneurysm basis. Digital subtraction CT angiography had sensitivities of 91.3% (42 of 46), 94.0% (140 of 149), 98.4% (186 of 189), and 100% (75 of 75) in depicting aneurysms of less than 3 mm, between 3 mm but less than 5 mm, between 5 mm but less than 10 mm, and 10 mm or greater, respectively, and of 95.8% (276 of 288) and 97.7% (167 of 171) in depicting anterior circulation and posterior circulation aneurysms, respectively. Excellent inter- and intrareader agreement was found on a per-patient (κ=0.900 and 0.939, both P<.001) and per-aneurysm basis (κ=0.846 and 0.921, both P<.001) for the detection of intracranial aneurysms with digital subtraction CT angiography.

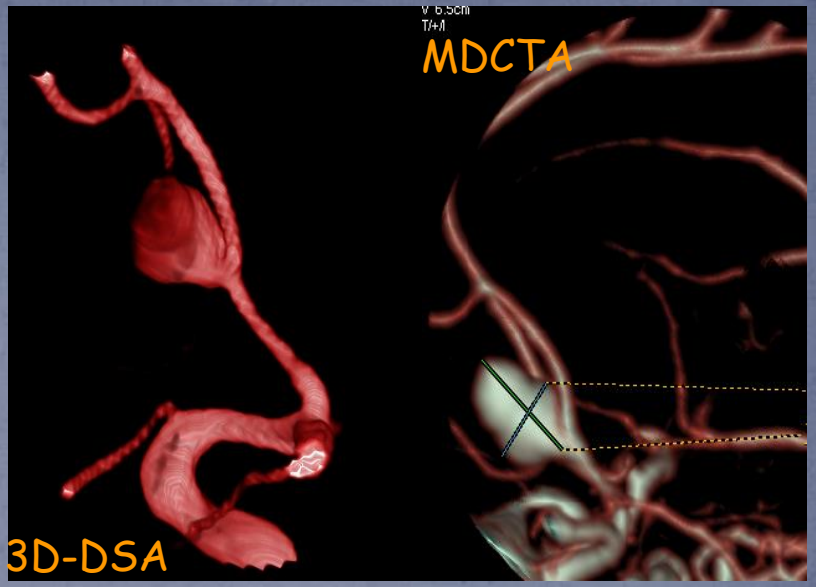
CONCLUSION: Digital subtraction CT angiography has a high sensitivity and specificity in depicting intracranial aneurysms with different sizes and at different locations, compared with 3D DSA.

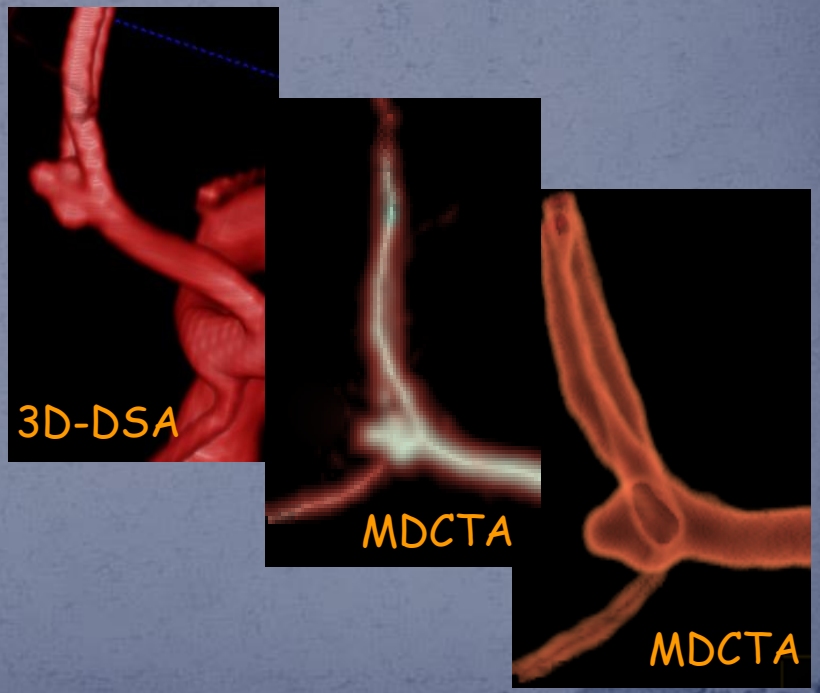
Dual-Energy CT Angiography in the Evaluation of Intracranial Aneurysms: Image Quality, Radiation Dose, and Comparison With 3D Rotational Digital Subtraction Angiography

AJR:194, January 2010




MDCTA
3D-DSA

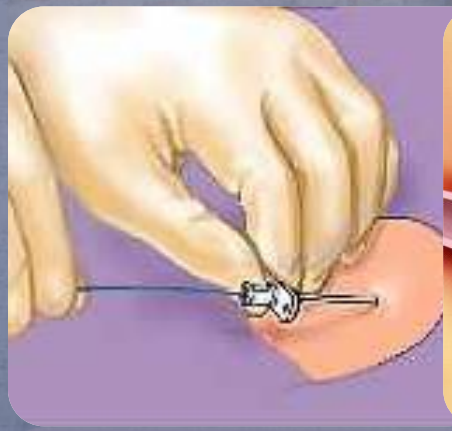

MDCTA
3D-DSA

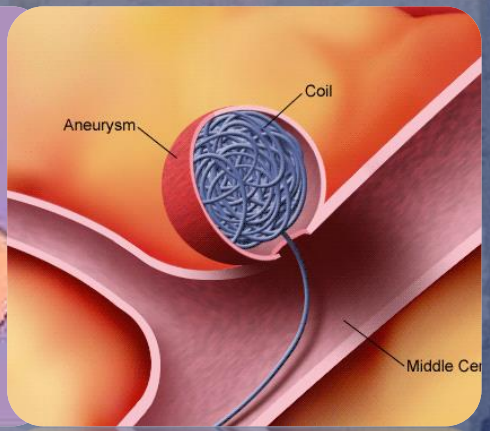

3D-DSA
MDCTA
MDCTA

ΘΕΡΑΠΕΙΑ ΑΝΕΥΡΥΣΜΑΤΟΣ

- Χειρουργική (clipping)

- Ενδοαγγειακή (coiling)





International Subarachnoid Aneurysm Trial (ISAT) of neurosurgical clipping versus endovascular coiling in 2143 patients with ruptured intracranial aneurysms: a randomized trial.

Molyneux A, Kerr R, Stratton I, Sandercock P, Clarke M, Shrimpton J, Holman R. Lancet. 2002: 360: 1267-74.

	Endovascular	Surgical
Died or had mRS score 3-6 at 1 year	23.7% (n= 801)	30.6% (n=793)

- Relative risk reduction favoring coiling is 22.6%. Absolute risk reduction is 6.9%.*

- The risk of rebleeding during the first year was 2.4 percent for the endovascular group and 1.0 percent for the surgical group. Rebleeding after 1 year was 2 per 1276 follow-up years for coiling patients and 0 per 1081 follow-up years for surgical patients.

Risk of recurrent subarachnoid haemorrhage, death, or dependence and standardised mortality ratios after clipping or coiling of an intracranial aneurysm in the International Subarachnoid Aneurysm Trial (ISAT): long-term follow-up

Andrew J Molyneux, Richard S C Kerr, Jacqueline Birks, Najib Ramzi, Julia Yarnold, Mary Sneade, Joan Rischmiller, for the ISAT collaborators

Lancet Neurol 2009; 8: 427–33

	Rebleeding from target aneurysm*	Rebleeding from aneurysm that was known at baseline†	De novo aneurysm‡	Unknown aneurysm	Total
Endovascular (8447 person-years)	10 (3)	3 (2)	3 (1)	1 (1)	17 (7)
Neurosurgery (8177 person-years)	3 (3)§	1 (1)	3 (2)	0	7 (6)
Total	13 (6)	4 (3)	6 (3)	1 (1)	24 (13)

Numbers in parenthesis are deaths within 30 days of bleeding.*The target aneurysm is identified at the time of enrolment in the trial. †Other known aneurysms that were seen on the first angiogram but are not thought to have ruptured. ‡De novo aneurysms that were not seen on the first angiogram. §One patient crossed over to coiling. SAH=subarachnoid haemorrhage.

Table 2: **Rates of recurrent SAH after more than 1 year by treatment allocation**

	Endovascular (n=1046*; n=867†)	Neurosurgery (n=1041*; n=857†)
mRS score		
0 (no symptoms)	264	198
1 (minor symptoms)	217	211
2 (some restriction in lifestyle)	145	175
3 (substantial restriction in lifestyle)	83	93
4 (partly dependent)	24	18
5 (fully dependent)	22	18
6 (dead)	112	144
0–2 inclusive	626	584
3–6 inclusive	241	273
Probability of independence conditional on survival at 5 years	626 of 755 (83%)	584 of 713 (82%)
Probability of death	112 of 1046 (11%)	144 of 1041 (14%)
Relative risk of non-independence conditional on survival at 5 years	0·99, 0·94–1·03, p=0·61	
Relative risk of death at 5 years	0·77, 0·61–0·98, p=0·03	
Probability of survival and independence at 5 years	74%	71%

Data are number; number (%); relative risk, 95% CI, p value; or percentage. mRS=modified Rankin scale. *Ascertainment for death was almost complete but dependency status was missing (n=27 for endovascular; n=29 for neurosurgery). †Incomplete ascertainment of mRS at 5 years (n=206 missing for endovascular; n=213 missing for neurosurgery). Reasons for missing mRS score: centre did not follow up patients (n=56); mRS not available, data temporarily or permanently missing, or no dependency outcome value given at year 5 (n=418).

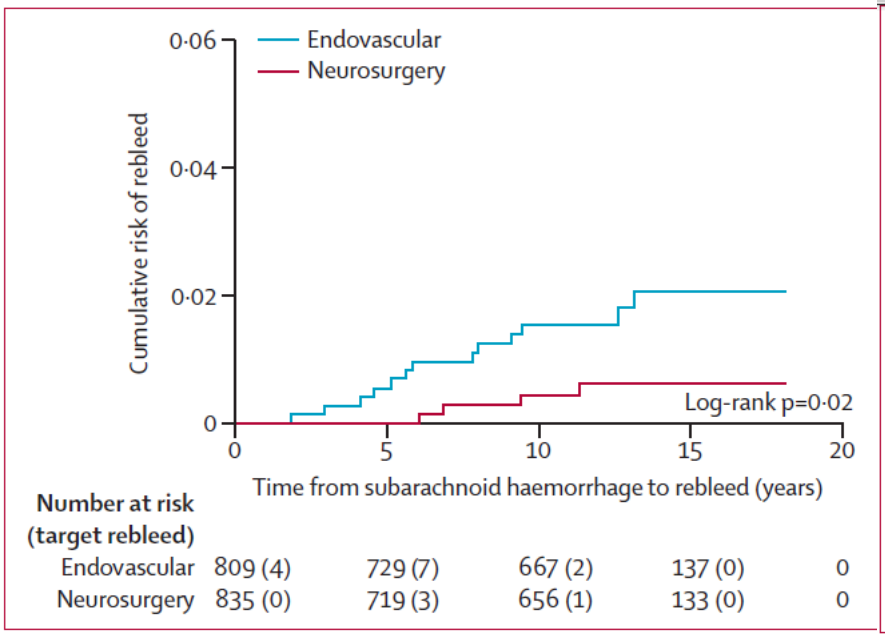
Table 4: **Clinical outcomes at 5 years**

- Η μακροχρόνια παρακολούθηση (9 χρόνια μ.ο) έδειξε ότι τα ποσοστά θανάτων λόγω επανάληψης της αιμορραγίας δεν διέφεραν στις δύο ομάδες
- Στην πενταετία
  - Μικρότερος κίνδυνος θανάτου στην ομάδα του coiling (11% vs 14%)
  - Ίδια ποσοστό επιβίωσης με ανεξαρτησία στις δύο ομάδες (83% vs 82%).

The durability of endovascular coiling versus neurosurgical clipping of ruptured cerebral aneurysms: 18 year follow-up of the UK cohort of the International Subarachnoid Aneurysm Trial (ISAT)

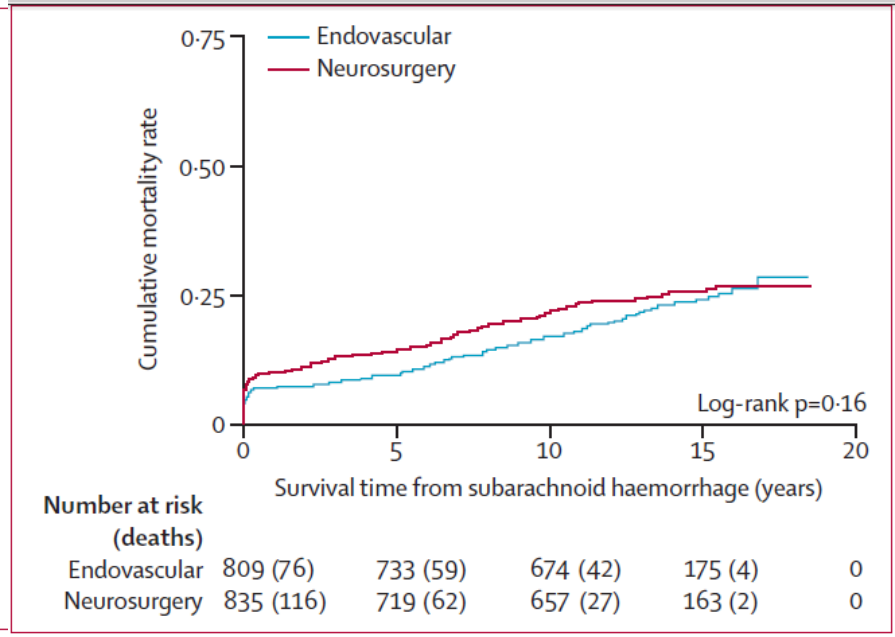
Andrew J Molyneux, Jacqueline Birks, Alison Clarke, Mary Sneade, Richard S C Kerr

Lancet 2015; 385: 691–97



Number at risk (target rebleed)					
Endovascular	809 (4)	729 (7)	667 (2)	137 (0)	0
Neurosurgery	835 (0)	719 (3)	656 (1)	133 (0)	0

Figure 1: **Kaplan-Meier plot of cumulative risk of rebleeding from target (treated) aneurysm later than 1 year after subarachnoid haemorrhage**

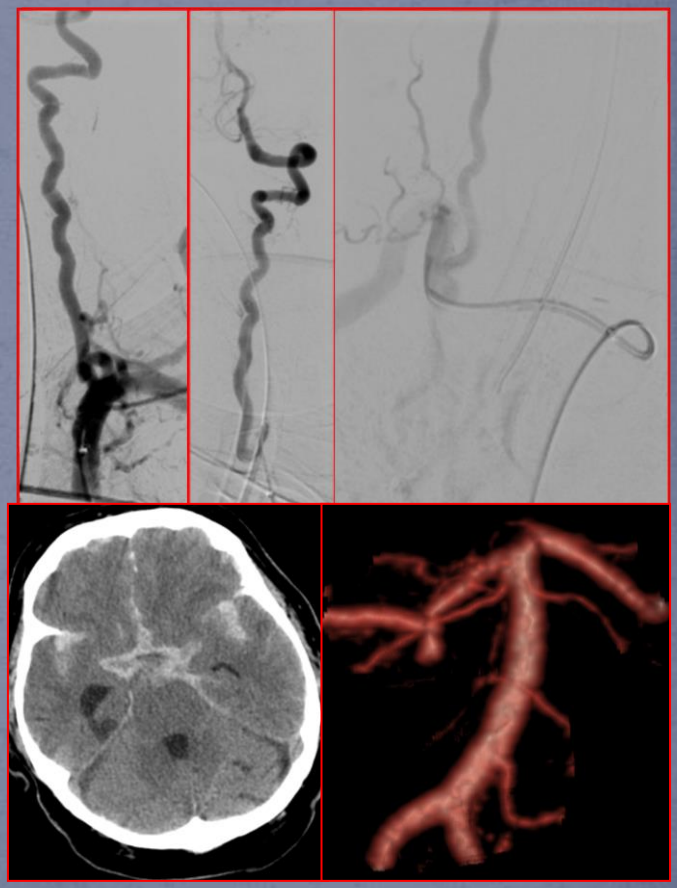


Number at risk (deaths)					
Endovascular	809 (76)	733 (59)	674 (42)	175 (4)	0
Neurosurgery	835 (116)	719 (62)	657 (27)	163 (2)	0

Figure 2: **Kaplan-Meier plot of cumulative mortality**
Patients observed for 10–18·5 years in 22 UK centres.

ΠΑΡΑΜΕΤΡΟΙ ΠΟΥ ΕΠΗΡΕΑΖΟΥΝ ΤΗΝ ΕΠΙΛΟΓΗ ΤΗΣ ΘΕΡΑΠΕΙΑΣ

- Ανατομία καρωτίδων/σπονδυλικών
- Εντόπιση
- Πολυπλοκότητα μορφολογίας
  - Ύπαρξη εκφυόμενων κλάδων από το ανεύρυσμα
  - Σχέση μεγέθους αυχένα/σάκου (1:2)
- Ευκολία στην χειρουργική/ενδαγγειακή προσπέλαση – σχέση ανευρύσματος με την γωνία χειρουργικού παραθύρου
- Ηλικία-Χειρουργικός κίνδυνος

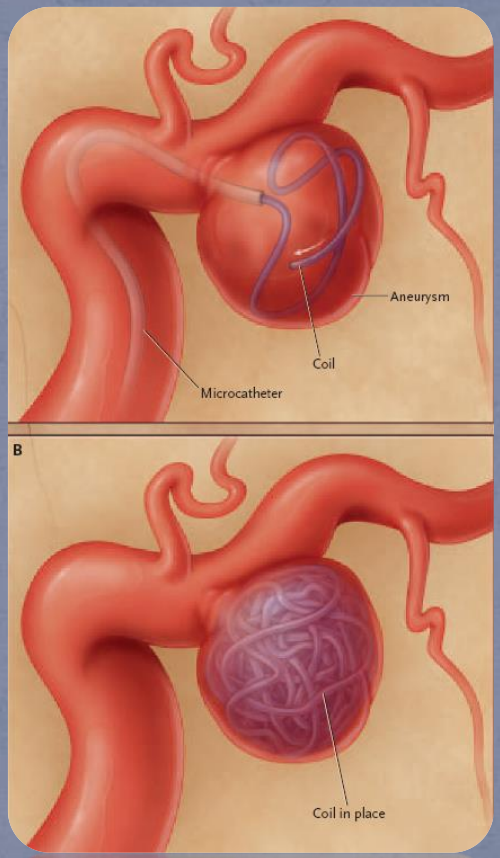


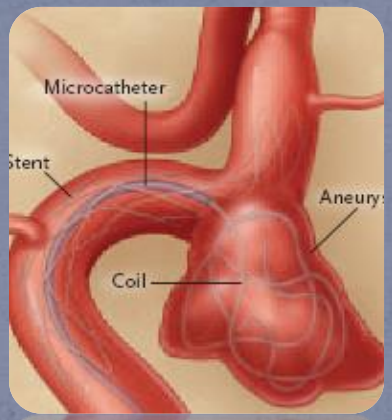
ΣΥΝΕΡΓΑΣΙΑ ΕΠΕΜΒΑΤΙΚΟΥ - ΝΕΥΡΟΧΕΙΡΟΥΡΓΟΥ

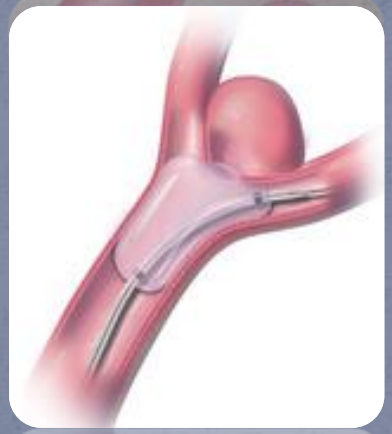
Άνδρας 54 ετών
SAH ΔΕ σχισμή Sylvious

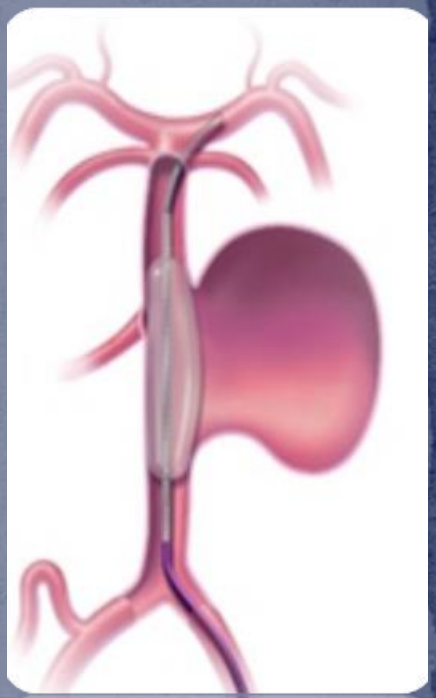
ΤΕΧΝΙΚΗ

- Γενική αναισθησία
- Seldinger τεχνική
- 5000 U Heparine
- Οδηγός καθετήρας στην έσω καρωτίδα (5-6F)
- Καθετηριασμός κοινής καρωτίδας?
- Μικροκαθετήρας και μικροσύρμα για τον καθετηριασμό του σάκου
- Τοποθέτηση σπειραμάτων





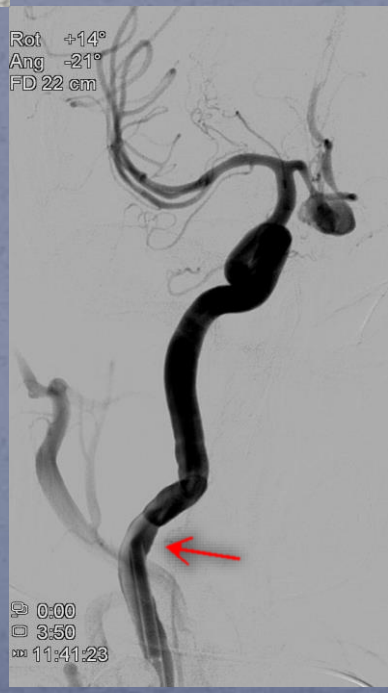


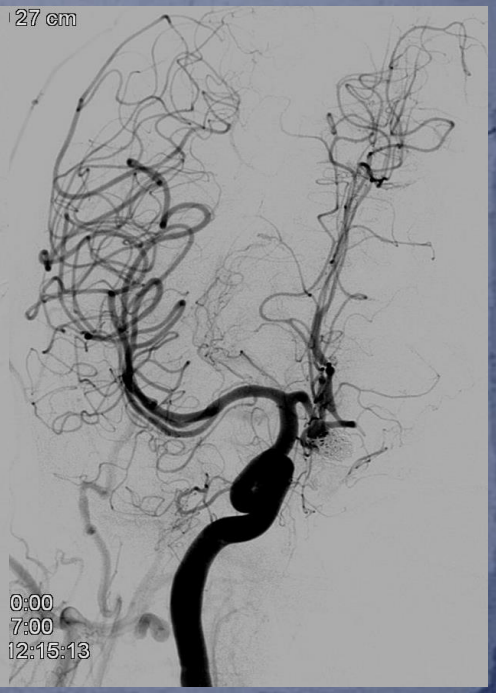


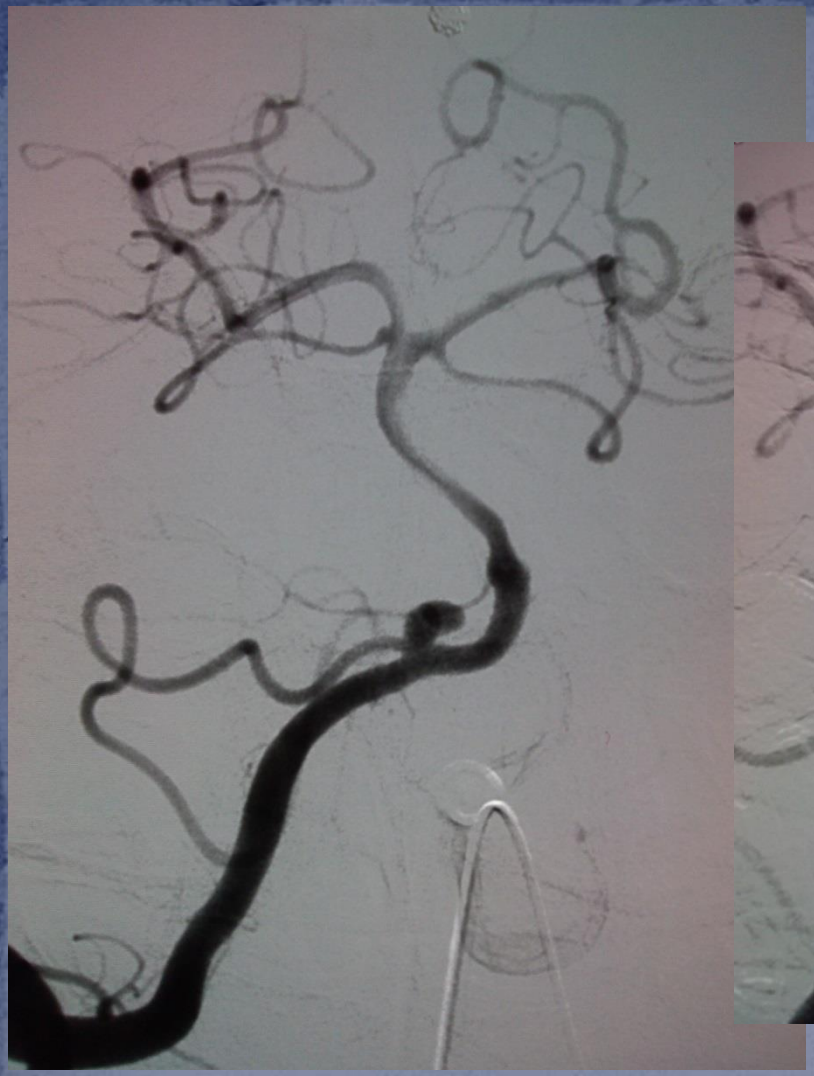
Balloon/stent remodeling

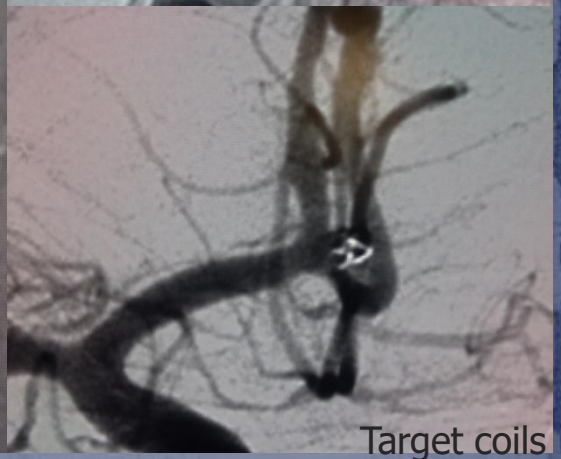
ΔΥΣΧΕΡΗΣ ΚΑΘΕΤΗΡΙΑΣΜΟΣ ΕΣΩ ΚΑΡΩΤΙΔΑΣ

ΠΡΟΣΒΑΣΗ ΑΠΟ ΚΟΙΝΗ ΚΑΡΩΤΙΔΑ

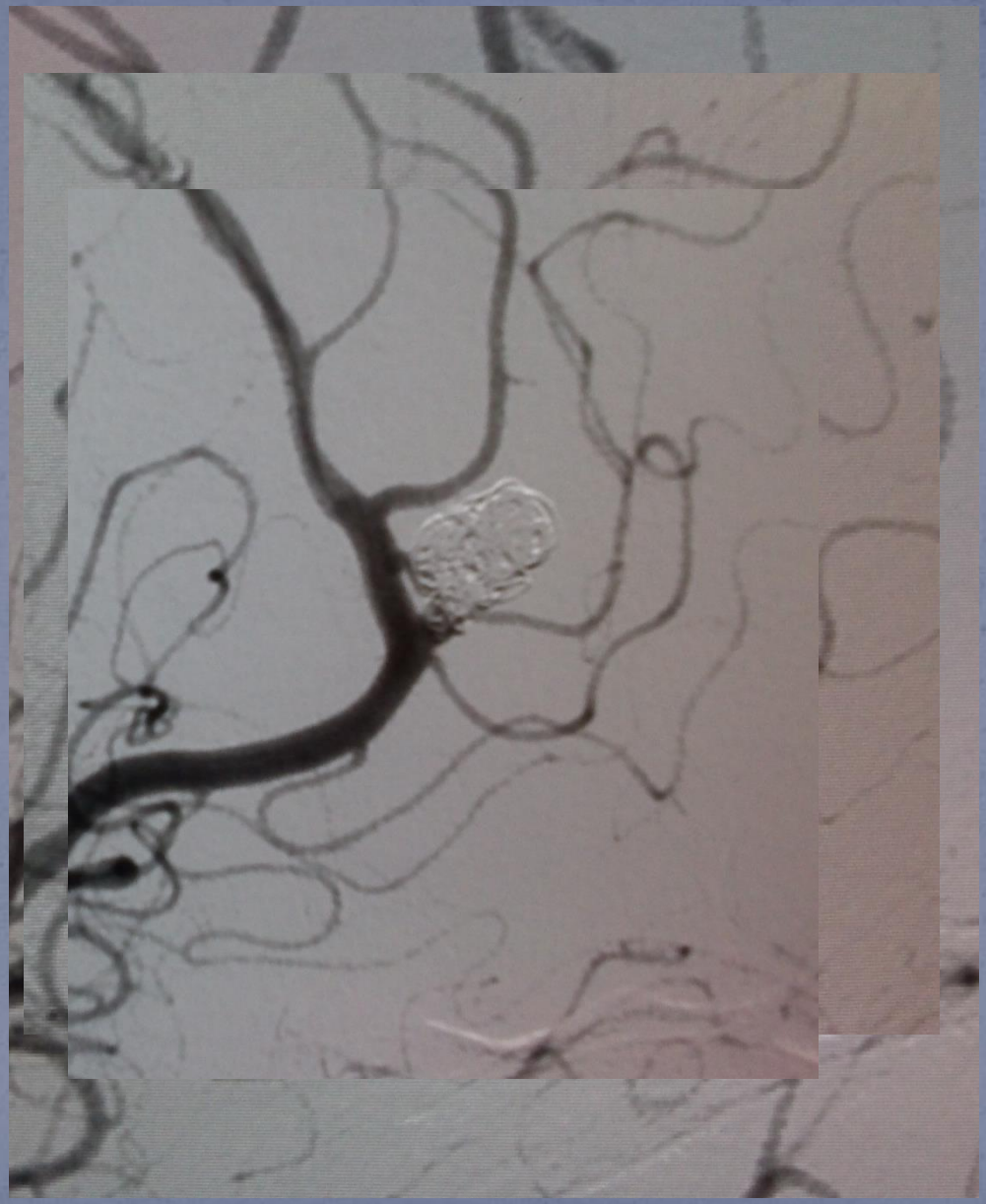






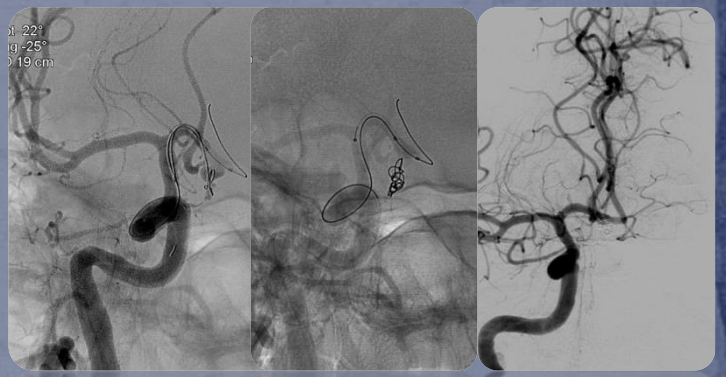


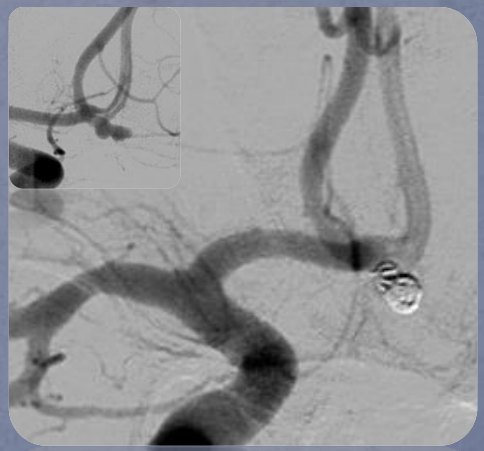
Target coils



ΕΠΙΠΛΟΚΕΣ ΕΝΔΟΑΓΓΕΙΑΚΗΣ ΘΕΡΑΠΕΙΑΣ

- Ρήξη
  - Πρώιμα – μπορεί να είναι καταστροφική,
    - εξουδετέρωση ηπαρίνης (50mg πρωταμίνης),
    - μείωση BP,
    - συνεχίζουμε την διαδικασία.
  - Καθυστερημένα – συνήθως με μικρές συνέπειες
- Μετανάστευση σπειράματος/προβολή επί του αυλού του αγγείου
  - Ειδικές θηλιές /500mg Aspirin IV
- Θρομβοεμβολικά επεισόδια
  - Reo-pro IA 10-20 mg bolus
- Αιμάτωμα / διαχωρισμός από το σημείο παρακέντησης
  - Συσκευές αιμόστασης



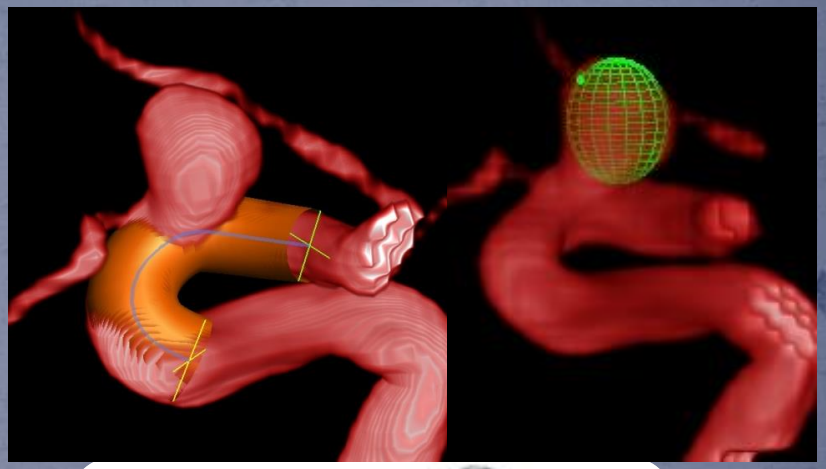


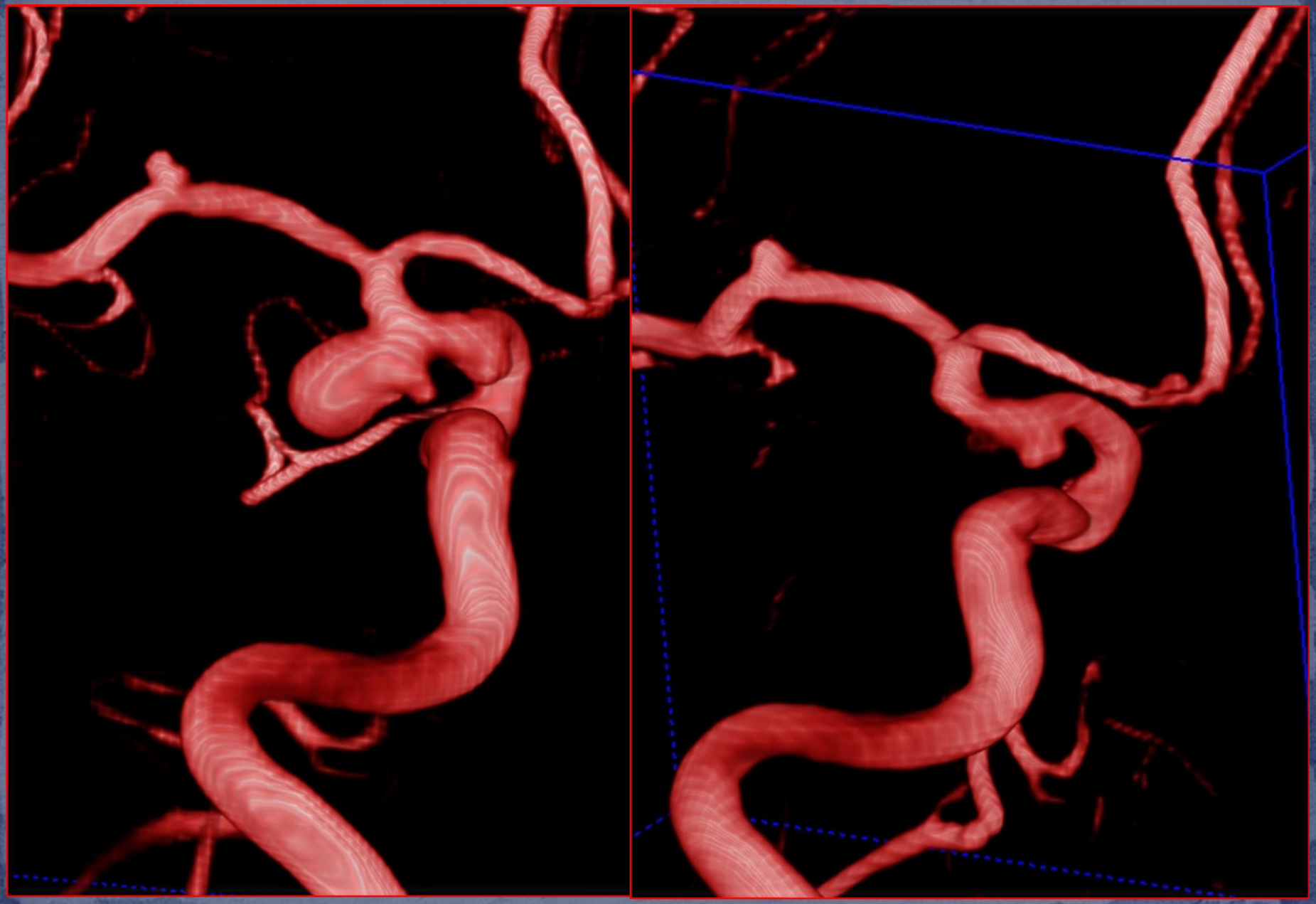
1-5% (2-3%) μείζονα επιπλοκή ή θάνατος

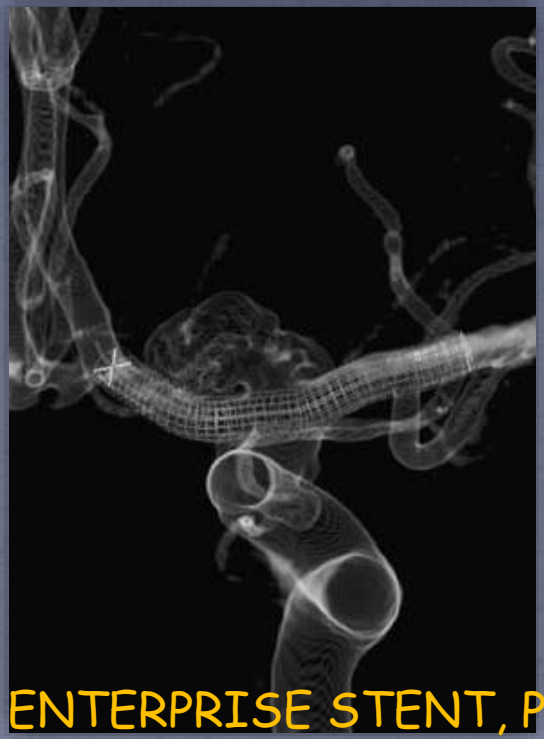
NEJM Aug 2006

ΕΞΕΛΙΞΕΙΣ ΣΤΗΝ ΤΕΧΝΙΚΗ

- Τρισδιάστατη ψηφιακή αγγειογραφία
- Μεγάλη ποικιλία αποσπώμενων σπειραμάτων (coils)
  - Βίο-ενεργά σπειράματα (Matrix, etc)
  - Σπειράματα με γέλη (Hydro-coils)
  - Πιο παχιά αλλά εύκαμπτα σπειράματα (Penumbra)
- Ανακατασκευή με μπαλόνι (balloon remodelling)
- Μεταλλικές ενδοπροθέσεις (Stents)
  - Πιο εύκαμπτα
  - Πλήρως επανασυρόμενα
  - Μικρές κυψέλες
  - Αλλαγή στη ροή (δυσπλαστικά αγγεία, ατρακτοειδή ανευρύσματα, πχ Pipeline)





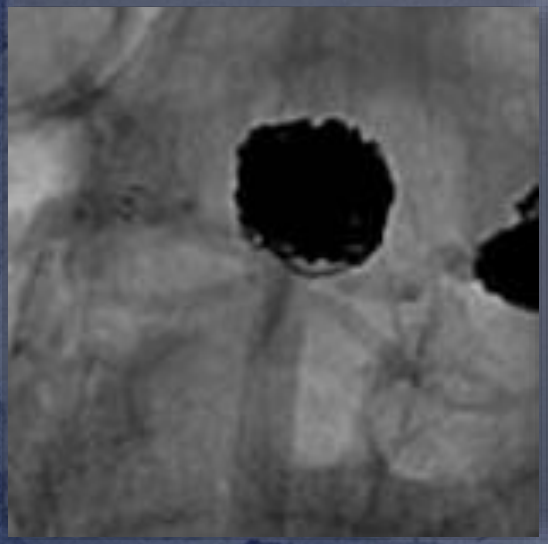

ENTERPRISE STENT, PROWLER MICROCATHETER

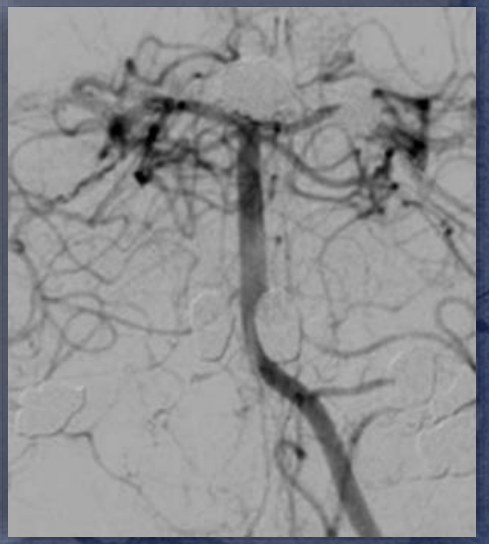



LVA


RT CAROTID


LT VERTEBRAL



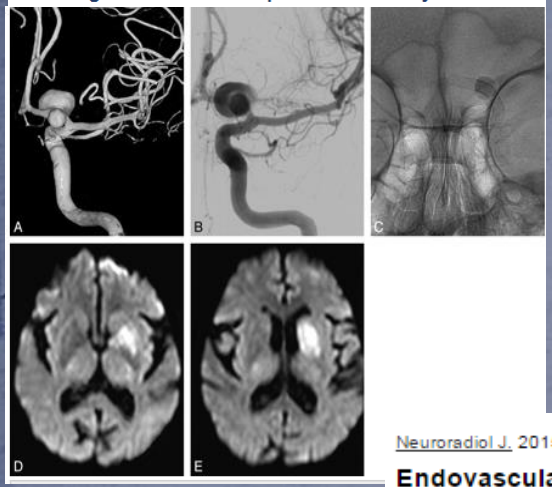


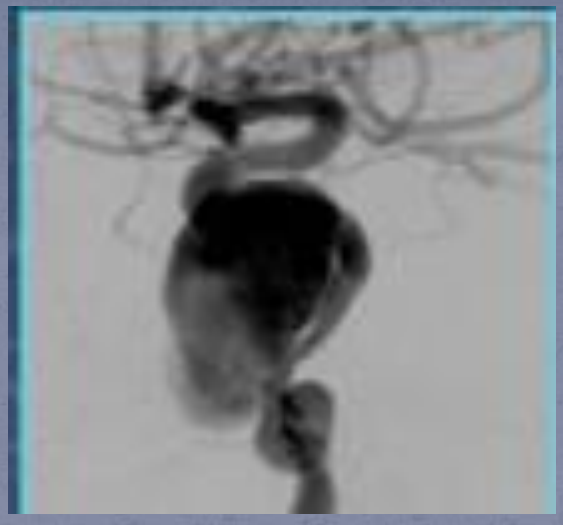
ΣΥΣΚΕΥΕΣ ΑΝΑΔΙΑΜΟΡΦΩΣΗΣ ΡΟΗΣ

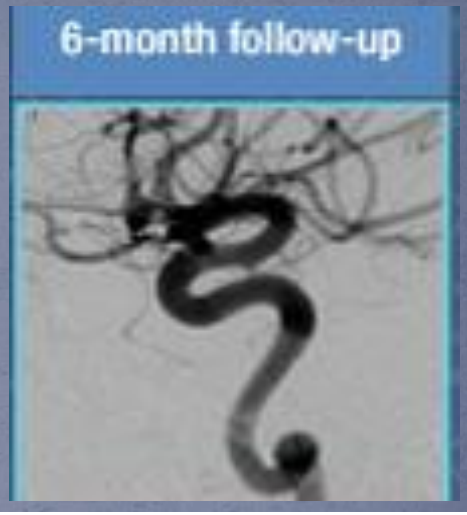
American Journal of Neuroradiology 31:E43-E44, April 2010

W.J. van Rooij[a] and M. Sluzewski[a]

Perforator Infarction after Placement of a Pipeline Flow-Diverting Stent for an Unruptured A1 Aneurysm







Neuroradiol J. 2015 Aug;28(4):365-375. Epub 2015 Aug 27.

Endovascular treatment of cerebral aneurysms using flow-diverter devices: A systematic review.

Briganti F[1], Leone G[2], Marseglia M[2], Mariniello G[3], Caranci F[4], Brunetti A[4], Maiuri F[3].

Author information

Abstract

BACKGROUND: Flow-diverter devices (FDDs) are new-generation stents placed in the parent artery at the level of the aneurysm neck to disrupt the intra-aneurysmal flow thus favoring intra-aneurysmal thrombosis.

OBJECTIVE: The objective of this review article is to define the indication and results of the treatment of intracranial aneurysms by FDD, reviewing 18 studies of endovascular treatment by FDDs for a total of 1704 aneurysms in 1483 patients.

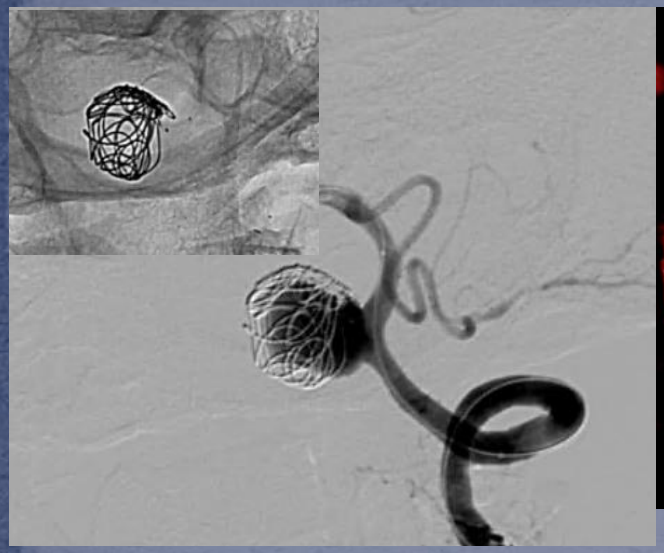
METHODS: The medical literature on FDDs for intracranial aneurysms was reviewed from 2009 to December 2014. The keywords used were: "intracranial aneurysms," "brain aneurysms," "flow diverter," "pipeline embolization device," "silk flow diverter," "surpass flow diverter" and "FRED flow diverter."

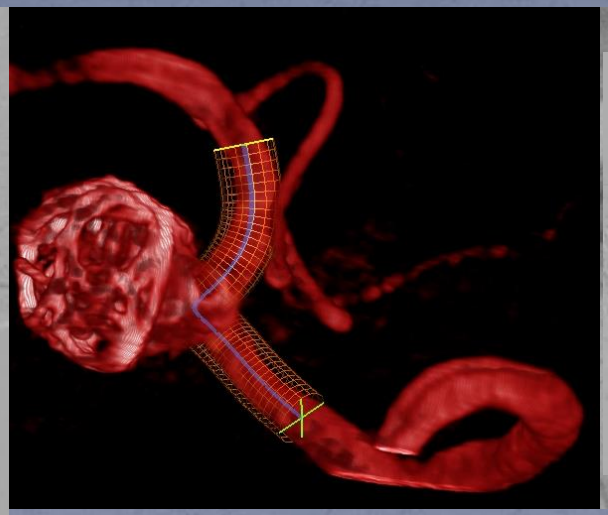
RESULTS: The use of these stents is advisable mainly for unruptured aneurysms, particularly those located at the internal carotid artery or vertebral and basilar arteries, for fusiform and dissecting aneurysms and for saccular aneurysms with large necks and low dome-to-neck ratio.

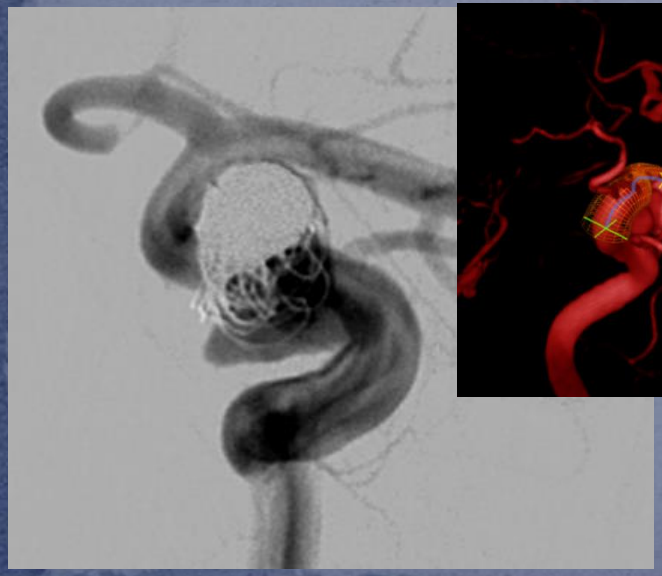
The rate of aneurysm occlusion progressively increases during follow-up (81.5% overall rate in this review). The non-negligible rate of ischemic (mean 4.1%) and hemorrhagic (mean 2.9%) complications, the neurological morbidity (mean 3.5%) and the reported mortality (mean 3.4%) are the main limits of this technique.

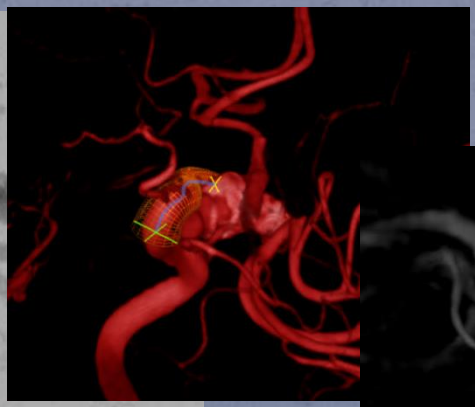
CONCLUSION: Treatment with FDDs is a feasible and effective technique for unruptured aneurysms with complex anatomy (fusiform, dissecting, large neck, bifurcation with side branches) where coiling and clipping are difficult or impossible. Patient selection is very important to avoid complications and reduce the risk of morbidity and mortality. Further studies with longer follow-up are necessary to define the rate of complete occlusion.

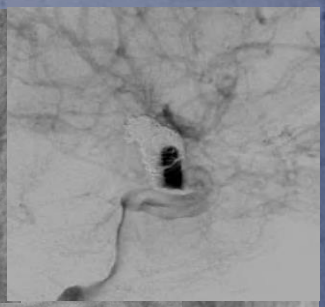
FLOW DIVERTER

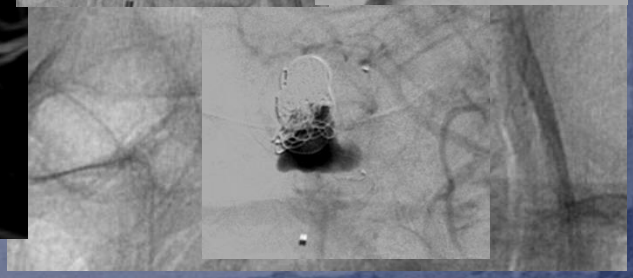












Open Access Review

SVN Stroke and Vascular Neurology

Cerebral aneurysm treatment: modern neurovascular techniques

Jiang B, *et al. Stroke and Vascular Neurology* 2016;

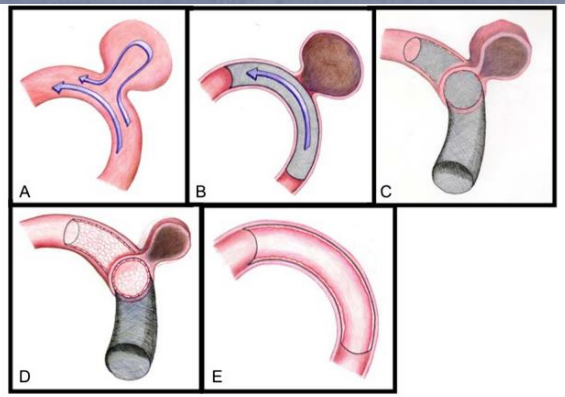


Figure 1 Flow diversion concept: placement of a high-mesh density stent (flow diverter) in the parent vessel disrupts blood flow into the aneurysm (A and B), allowing for progressive intra-aneurysmal thrombosis over time with subsequent obliteration of the aneurysm (C and D). Additionally, the flow diverter provides a scaffold for neoendothelialisation, which treats the weakened abnormal arterial wall and isolates the aneurysm from the parent circulation resulting in durable occlusion of the aneurysm (E).

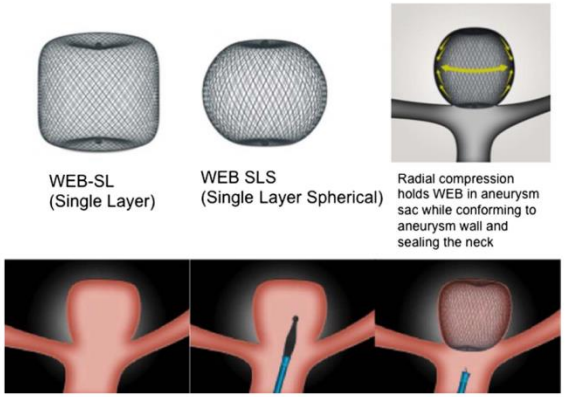


Figure 3 WEB intrasaccular flow disruption system. SL, single layer; WEB, Woven EndoBridge; WEB SLS, WEB SL device with a spherical shape. Images provided by Sequent Medical.

Open access Review

SVN Stroke and Vascular Neurology

Advances in endovascular aneurysm management: coiling and adjunctive devices

Campos JK, *et al. Stroke & Vascular Neurology* 2020;

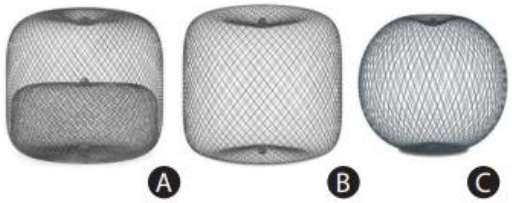
In recent years, novel stents and stent-like devices have been designed to serve as adjunctive treatments for endovascular coiling of wide-neck aneurysms. These include Cascade, Comaneci, pCANvas and eCLIPS.

Development of New Endovascular Devices for Aneurysm Treatment

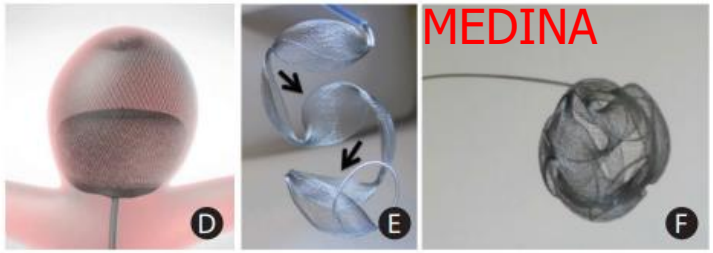
Journal of Stroke 2018;20(1):46-56.

Zhen Yu Jia[a,b], Hai Bin Shi[b], Shigeru Miyachi[c], Sun Moon Hwang[a], Jae Jon Sheen[a], Yun Sun Song[a], Joong Goo Kim[a], Deok Hee Lee[a], Dae Chul Suh[a]

WEB

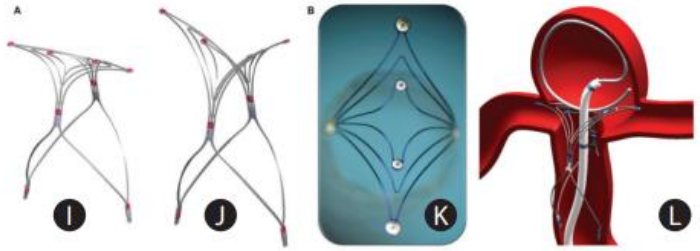


MEDINA



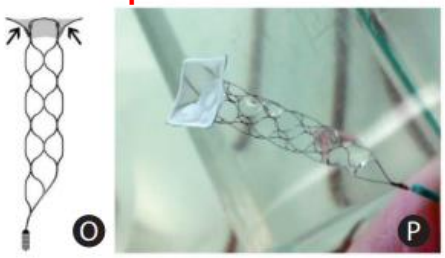
The Barrel stent device

The PulseRider device

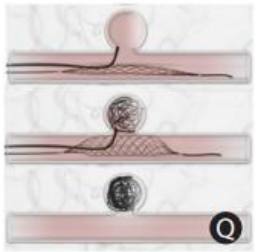


The pCONus

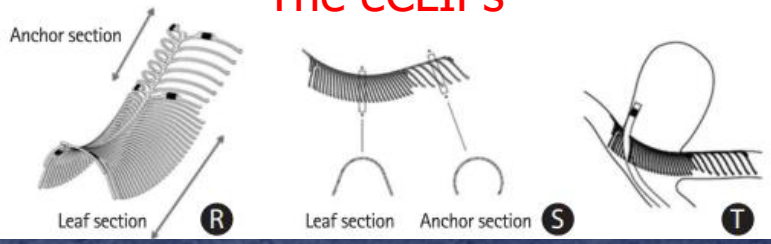
The pCANvas



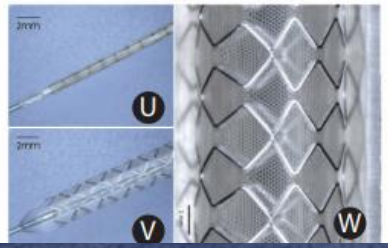
COMANENCI



The eCLIPs



Honeycomb microporous covered stent



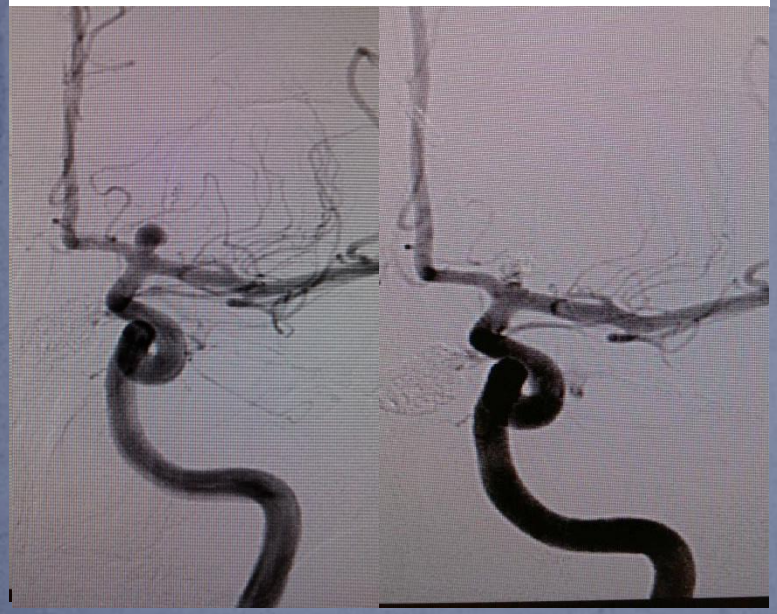
ORIGINAL RESEARCH

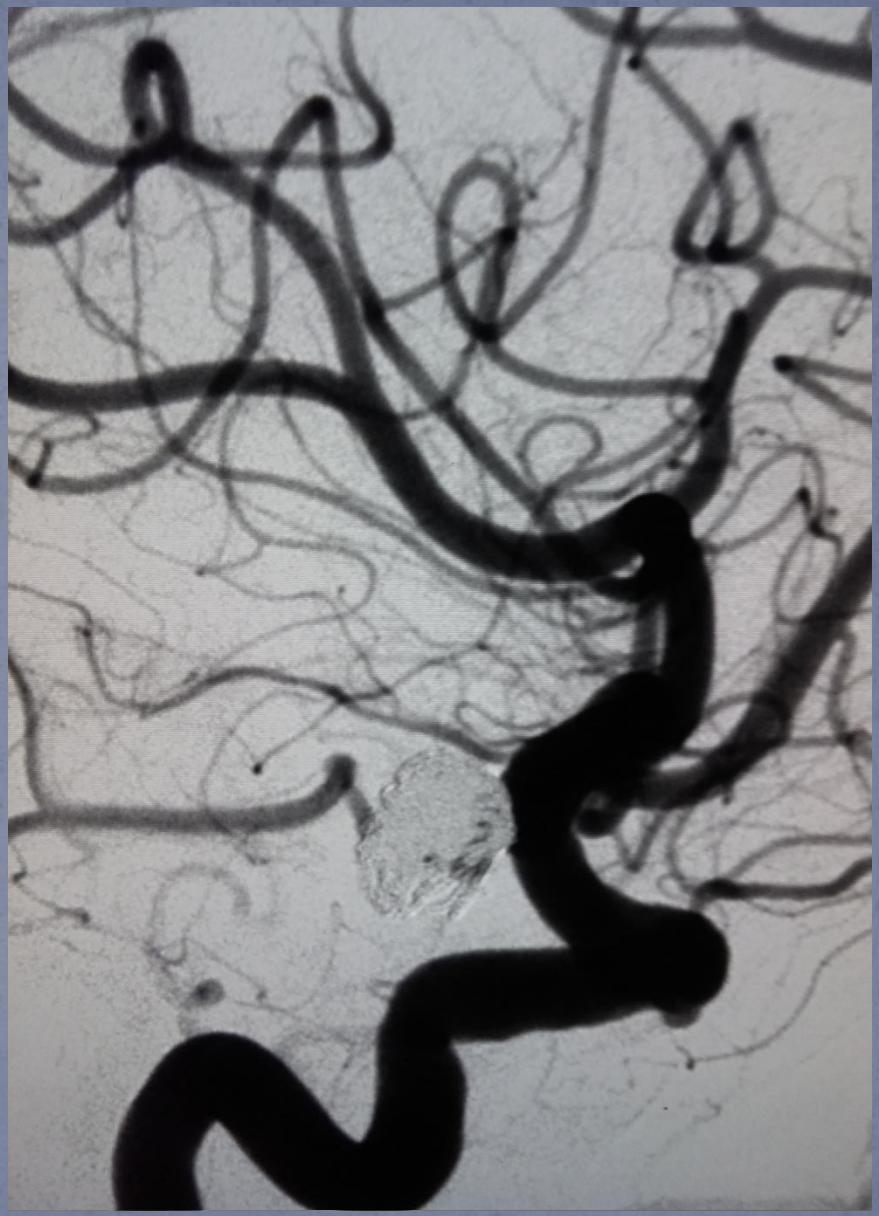
Volume versus standard coils in the treatment of intracranial aneurysms

Johannes Kaesmacher,[1] Christina Müller-Leisse,[1] Thomas Huber,[1] Tobias Boeckh-Behrens,[1] Bernhard Haller,[2] Ehab Shiban,[3] Benjamin Friedrich,[4] Claus Zimmer,[1] Franziska Dorn,[5] Sascha Prothmann[1]

Kaesmacher J, *et al*. *J NeuroInterv Surg* 2015;

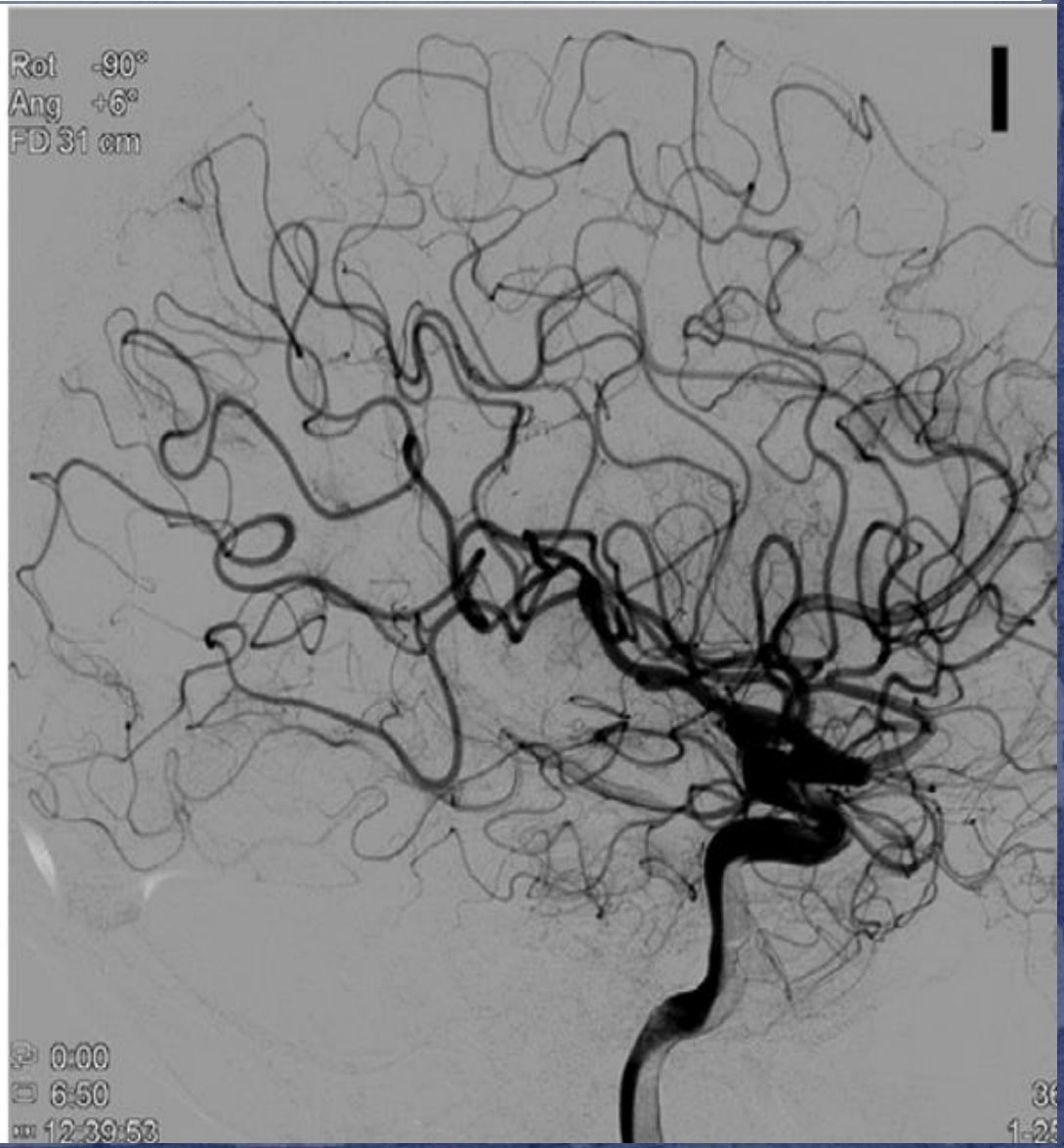
Conclusions Use of the PC400 system as opposed to conventional coils suggests that the PC400 system is safe and effective in treating intracranial aneurysms. Despite having been applied in a potentially more difficult-to-treat group, the use of PC400 was associated with less coil compaction and aneurysm recurrence in aneurysms ≥7 mm.

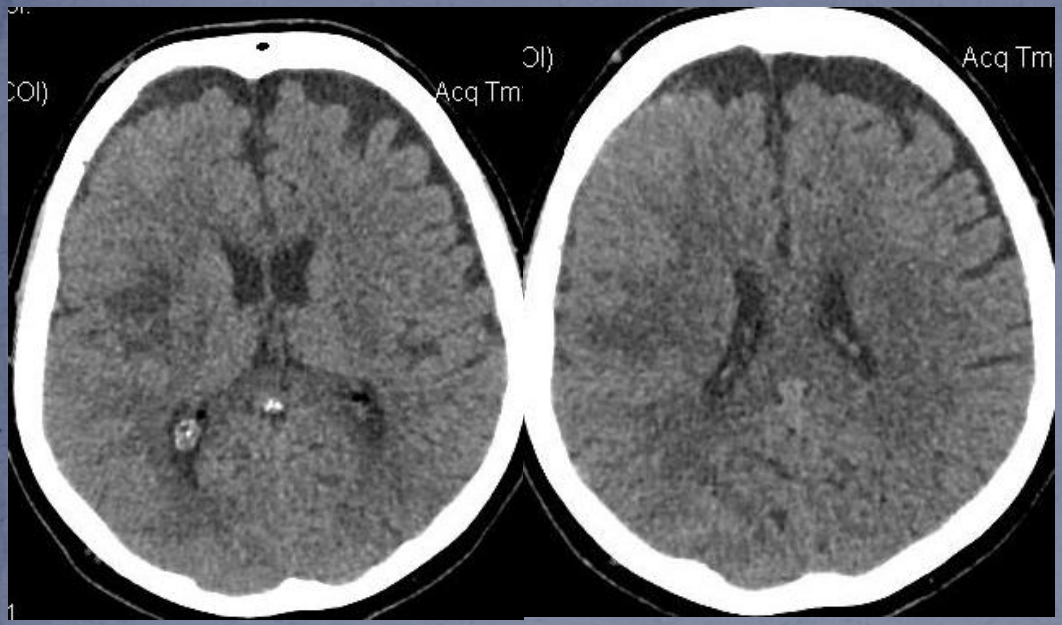


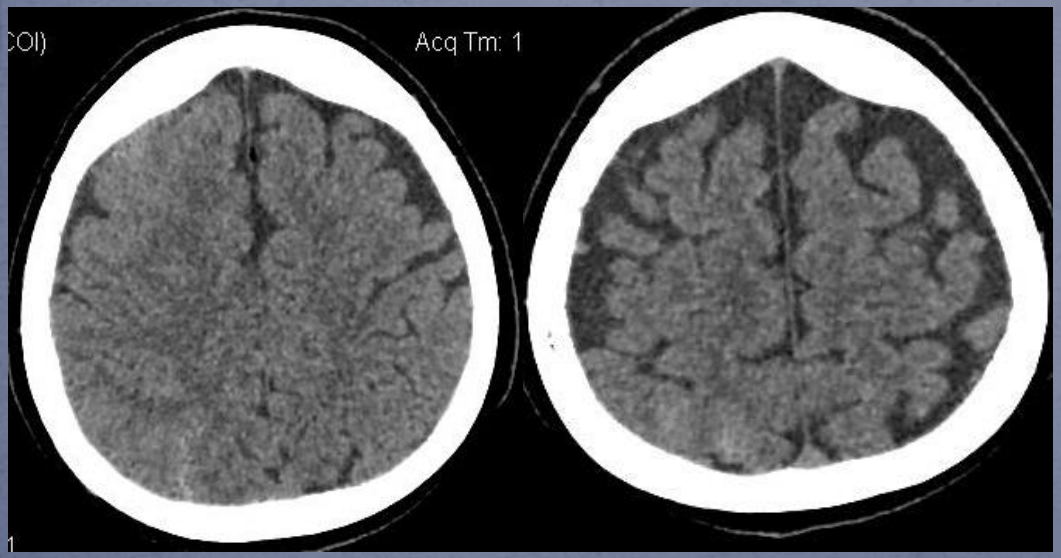


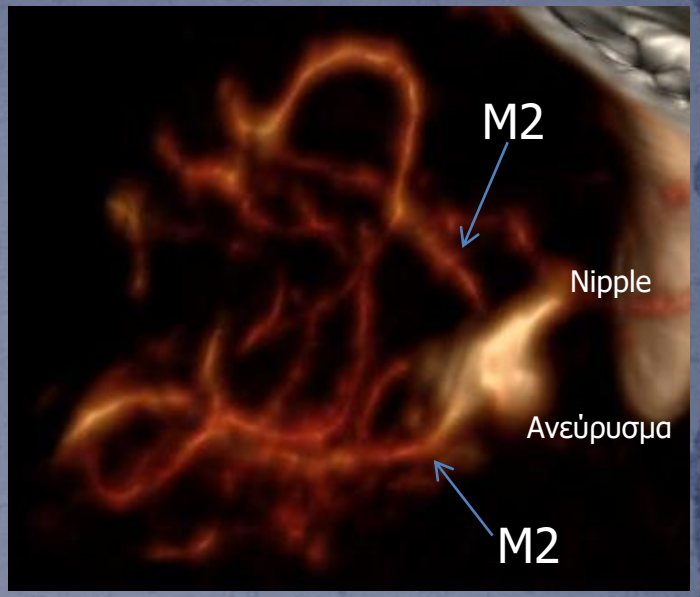
Retrieval of Distally Migrated Coil with Direct Aspiration Technique During Temporary Bridging Device Embolization of a Wide-Neck Supraophthalmic Aneurysm

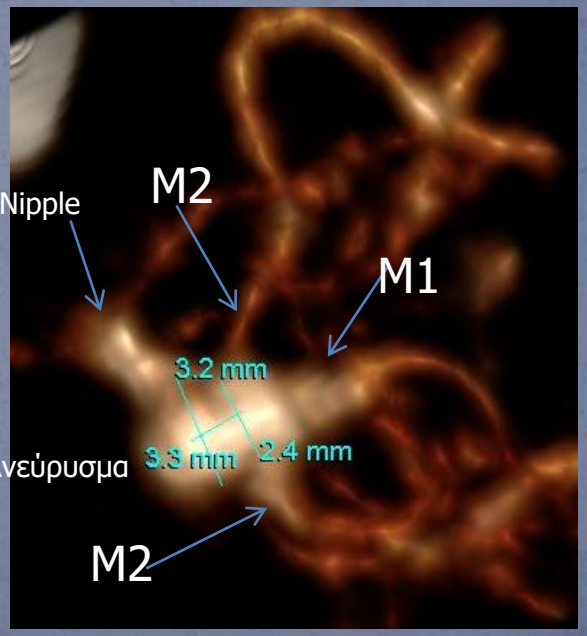
Vasileios Panagiotopoulos[1,2], Petros Zampakis[2], Dimitrios Karnabatidis[3], Lampros Messinis[4], Georgios Gatzounis[1]

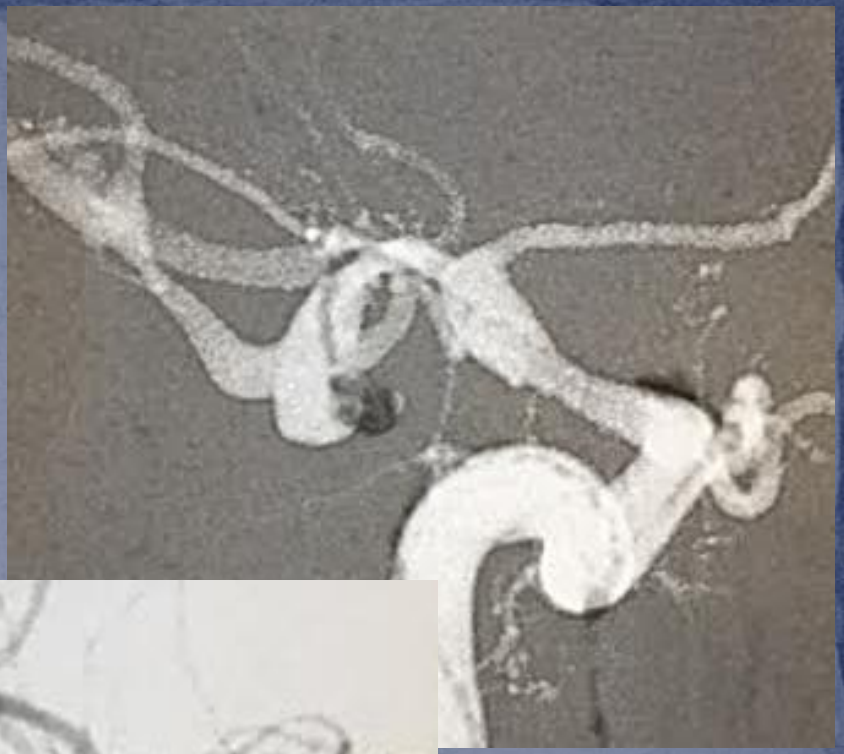


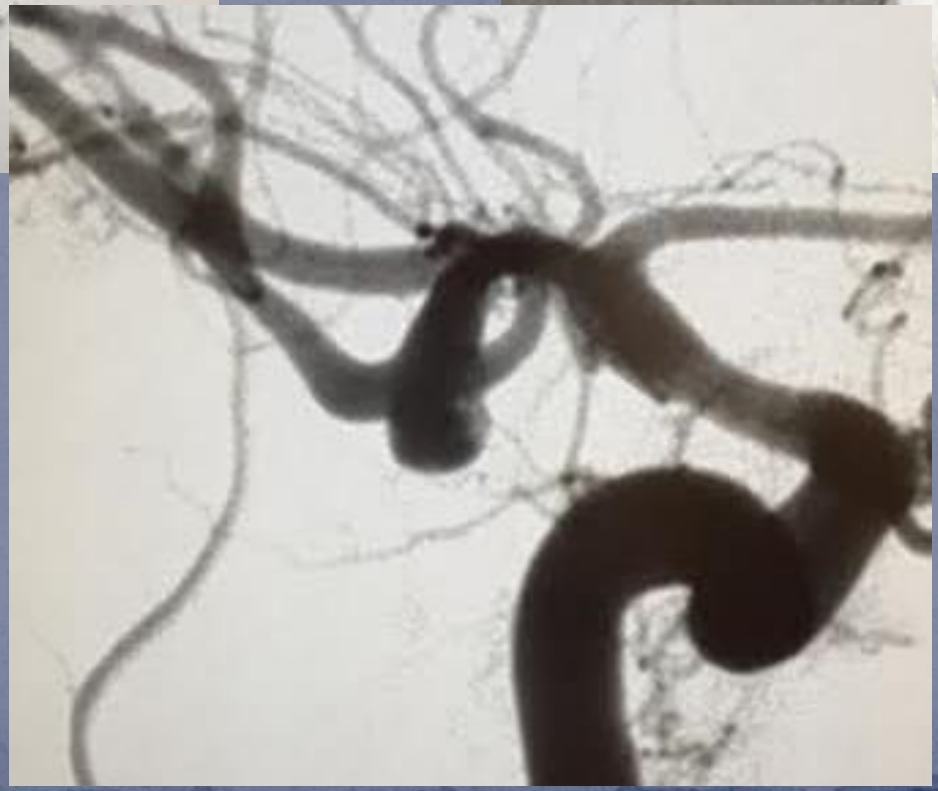

Acq Tm

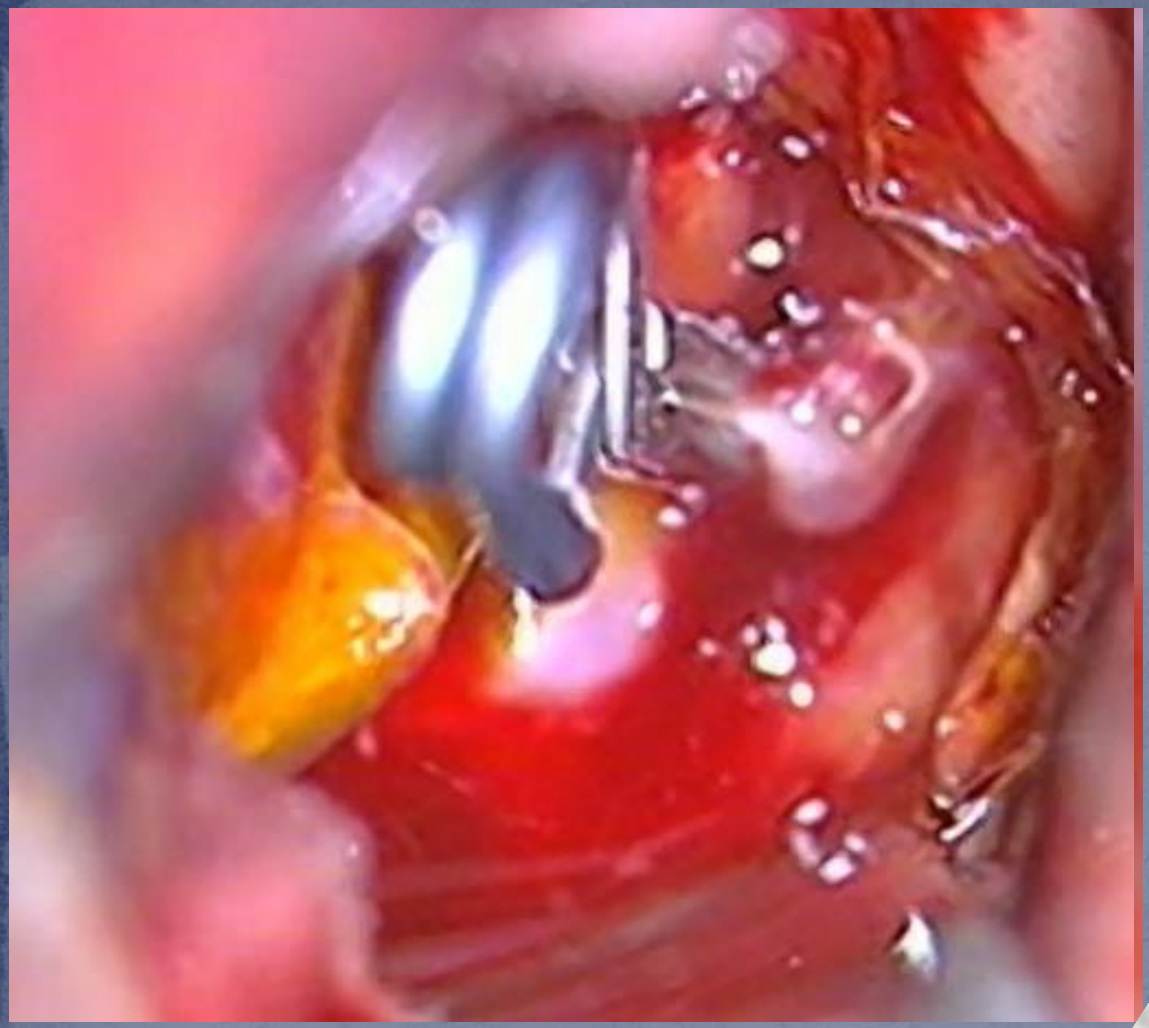

Acq Tm: 1

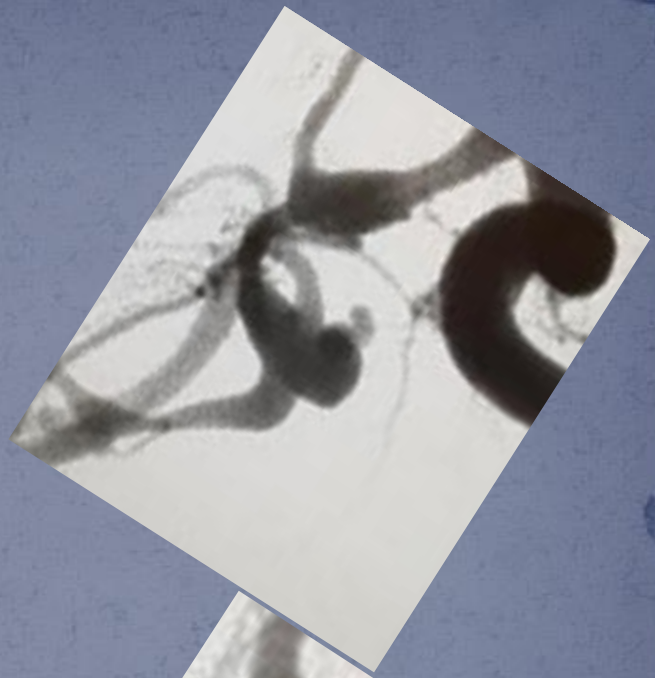

M2
Nipple
Ανεύρυσμα
M2

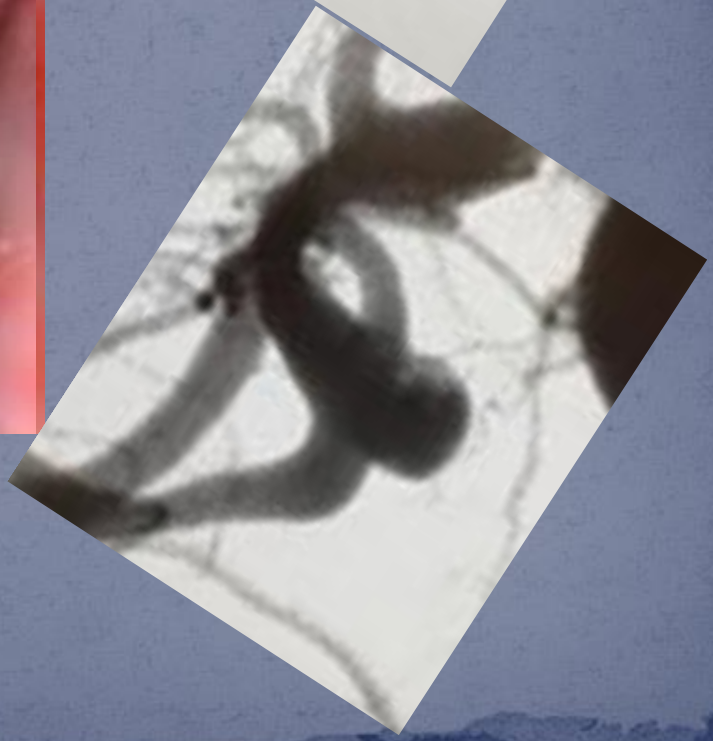

Nipple
M2
M1
3.2 mm
3.3 mm
2.4 mm
Ανεύρυσμα
M2

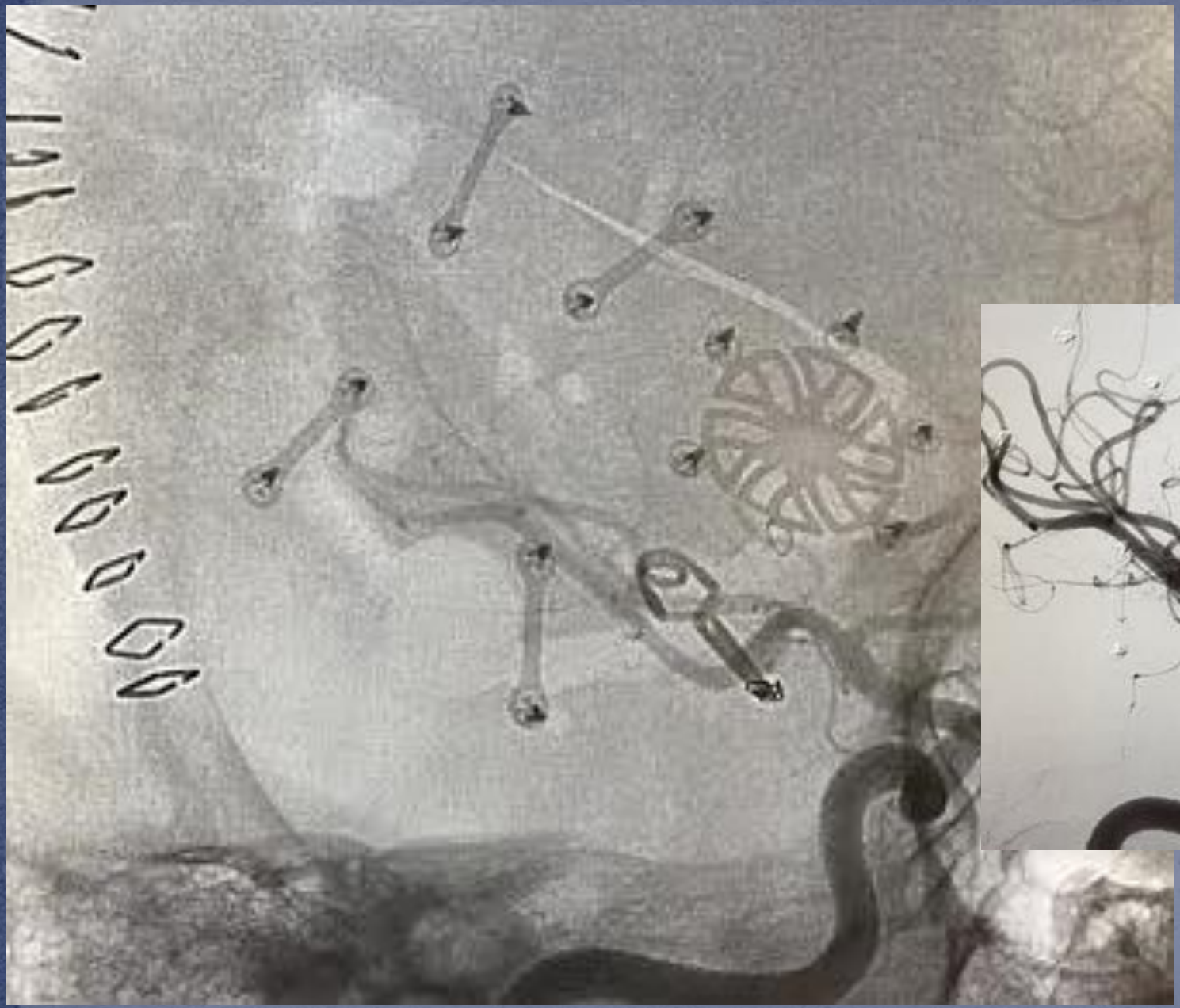












ΣΥΜΠΕΡΑΣΜΑΤΑ

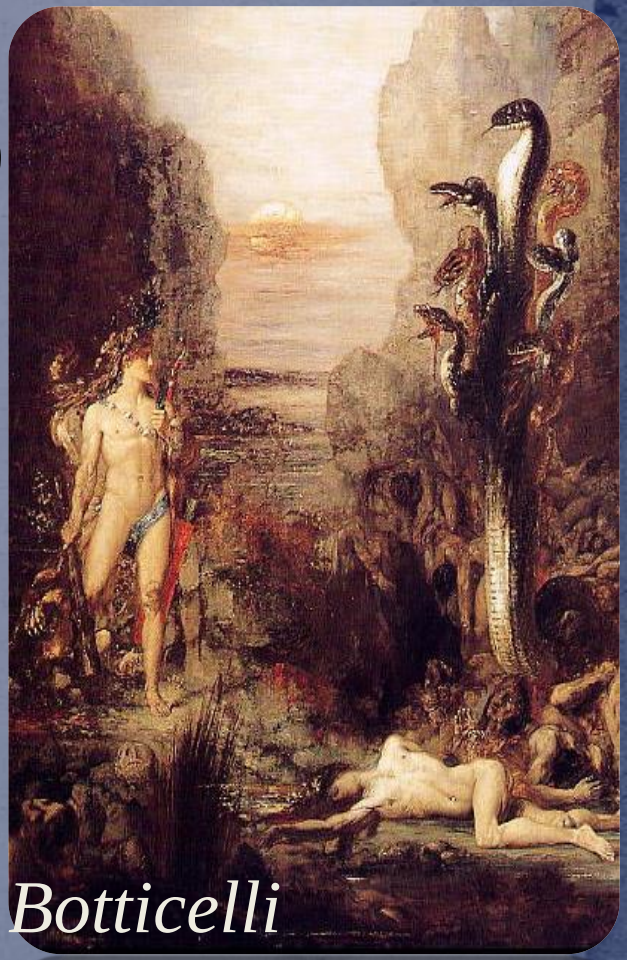
- Τα ραγέντα ανευρύσματα θα πρέπει να αντιμετωπίζονται όσο το δυνατόν πιο σύντομα
- Τα ανευρύσματα με ευρείς αυχένες που απαιτούν τοποθέτηση stent ίσως αρχικά θα πρέπει να αντιμετωπίζονται μερικώς και στη συνέχεια να γίνεται η οριστική θεραπεία τους
- Η χαρτογράφηση της ανατομίας της καρωτίδας είναι πολύ σημαντική σε μεγάλης ηλικίας ασθενείς
- Η αντιμετώπιση των μη ραγέντων ανευρυσμάτων αποτελεί μεγάλη πρόκληση και θα πρέπει να εξατομικεύεται
- Λόγω των συνεχών ταχέως εξελισσόμενων τεχνικών βελτιώσεων, η ενδαγγειακή αντιμετώπιση γίνεται εφικτή ακόμα και σε πολύ δύσκολα περιστατικά
- Γονιδιακή θεραπεία ??

BAVMs

- ✓ Ανώμαλη αρτηριοφλεβώδης επικοινωνία (φωλεά από ανώμαλες αγγειακές συνδέσεις)
- ✓ Τροφοφόρες αρτηρίες
- ✓ Αποχετευτικές φλέβες
- ✓ Μη λειτουργικό εγκεφαλικό παρέγχυμα

ΓΕΝΕΤΙΚΑ ΚΑΘΟΡΙΖΟΜΕΝΕΣ ΒΛΑΒΕΣ

- ✓ Γενετική «δυσλειτουργία» του τριχοειδικού δικτύου


Botticelli

ΚΑΙ ΤΩΡΑ ΤΙ ?

Antico, Florence

Συζήτηση με εξειδικευμένη ομάδα αντιμετώπισης

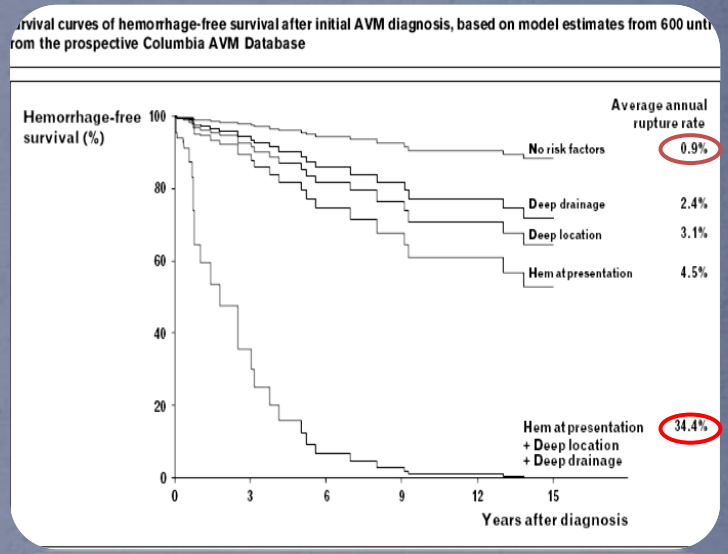
ΘΕΡΑΠΕΥΤΙΚΟ ΠΛΑΝΟ
ΕΞΑΤΟΜΙΚΕΥΣΗ

- Κίνδυνος αιμορραγίας

  Ιστορικό αιμορραγίας
  Ενδοφωλεικό ανεύρυσμα
  Εν τω βάθει φλεβική αποχέτευση
  Εν τω βάθει εντόπιση

- Παράγοντες σχετιζόμενοι με τον ασθενή
  - Κλινικό ιστορικό
  - Σοβαρότητα/ανοχή συμπτωμάτων
  - Ψυχολογικοί παράγοντες
  - Οικογενειακοί/ κοινωνικοί λόγοι

  «ΑΝΑΓΚΕΣ ΑΣΘΕΝΟΥΣ»
- Αγγειοαρχιτεκτονική AVM



ΕΠΙΛΟΓΗ ΤΗΣ ΒΕΛΤΙΣΤΗΣ ΘΕΡΑΠΕΙΑΣ

ΘΕΡΑΠΕΥΤΙΚΕΣ ΔΥΝΑΤΟΤΗΤΕΣ

- Συντηρητική θεραπεία
- Χειρουργική αντιμετώπιση
  - 1889 Giordano
  - Τέλη δεκαετίας 60 Yasargil (μικροχειρουργική)
  - Προσφέρει μόνιμη θεραπεία/ιδιαίτερα επεμβατική /εξαρτάται από εντόπιση
- Ενδαγγειακή θεραπεία
  - NBCA glue (1972)
  - Ανάλυση αγγειοαρχιτεκτονικής (Valavanis-Yasargil 1998)
  - Onyx (2002)-Νέοι μικροκαθετήρες/ μικροσύρματα
  - Ελάχιστα επεμβατική μέθοδος/ εξαρτάται από αγγειοαρχιτεκτονική
- Στερεοτακτική ακτινοβόληση
  - Gamma knife (1968 Leksell – Stockholm)
  - Linear accelerator (early '80s)
  - Καθόλου επεμβατική/ δεν προστατεύει τα πρώτα 2 έτη/ όχι σε μέγεθος >3 εκ
- Συνδυασμός

ΕΠΙΠΛΟΚΕΣ

- Ενδαγγειακός εμβολισμός
  - Συνολικά 9,1-11,9% (NBCA)
  - Μείζονες 1-2%

Overview WFITN 2005

  - Συνολικά 15-22% (Onyx)
  - Μείζονες 3-4%
- Στερεοτακτική ακτινοβόληση
  - 8%

Flickinger et al Int J Radiat Oncol Biol Phys 1999

- Χειρουργική Θεραπεία
  - 11-37%

Hartmann Stroke 2000

ΕΝΔΑΓΓΕΙΑΚΗ ΘΕΡΑΠΕΙΑ AVMs

ΣΤΟΧΟΙ

1. Θεραπεία AVM

Συνολικά ~20%-40%
Μικρές AVM ~60-70%

Εμβολισμός μόνο

Πριν από χειρουργείο /RSR

2. Μερική στοχευμένη θεραπεία

Ανευρύσματα ροής
Μείωση μεγέθους

3. Παρηγορητική θεραπεία

Επιληπτικές κρίσεις
Επιδεινούμενη νευρολογική συμπτωματολογία
Ανυπόφορες κεφαλαλγίες?

ΕΜΒΟΛΙΚΟΙ ΠΑΡΑΓΟΝΤΕΣ

ΥΓΡΟΙ ΠΑΡΑΓΟΝΤΕΣ

Κυανοακρυλική κόλλα (NBCA)

- Glubran-2 (CE marked)
- (Histoacryl)

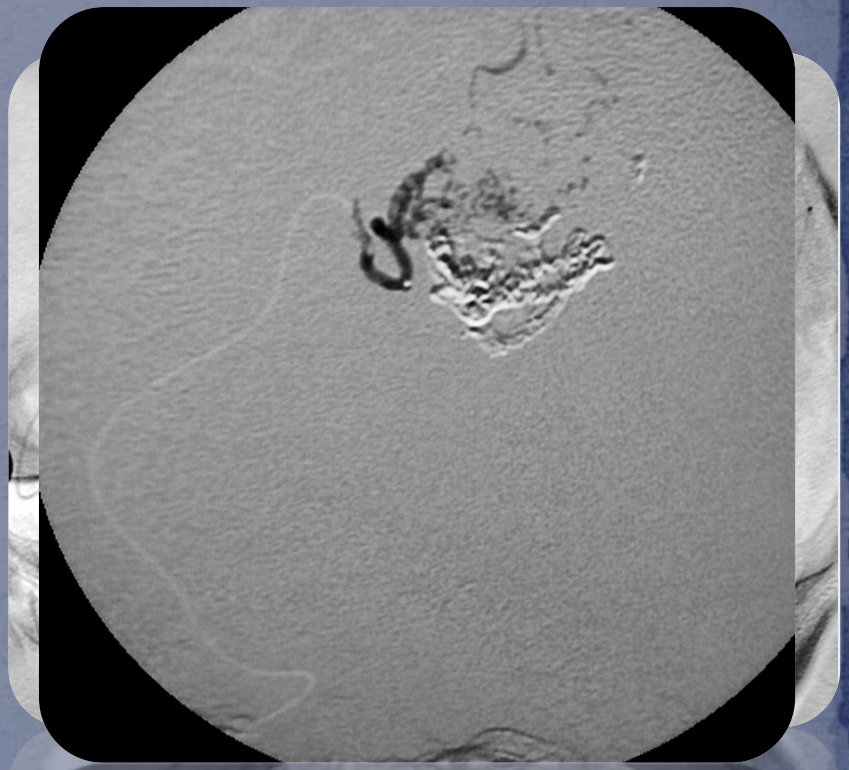
Μη κολλώδη πολυμερή

- Onyx
- (EVAL)

- ONYX ή κόλλα ??
- (Ο Όνυχας εμφανίζει καλύτερα ποσοστά θεραπείας αλλά συνδυάζεται με υψηλότερα ποσοστά επιπλοκών)

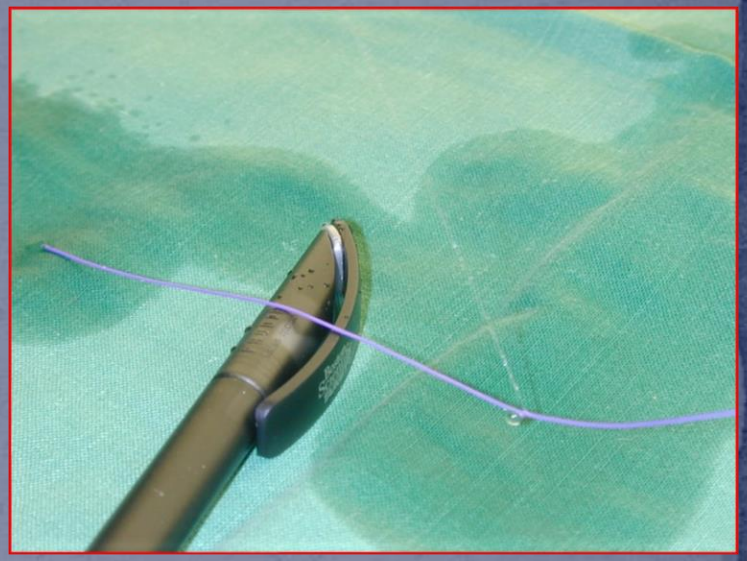
ΤΕΧΝΙΚΗ

- Γενική αναισθησία
- Seldinger τεχνική
- Μικροκαθετήρες ροής (1.2-1.8F)
- Μικροσύρματα:Mizzen, Mirage 008
- Ενδοφωλεακή έγχυση κόλλας
- Αναισθησιολογική συνεργασία

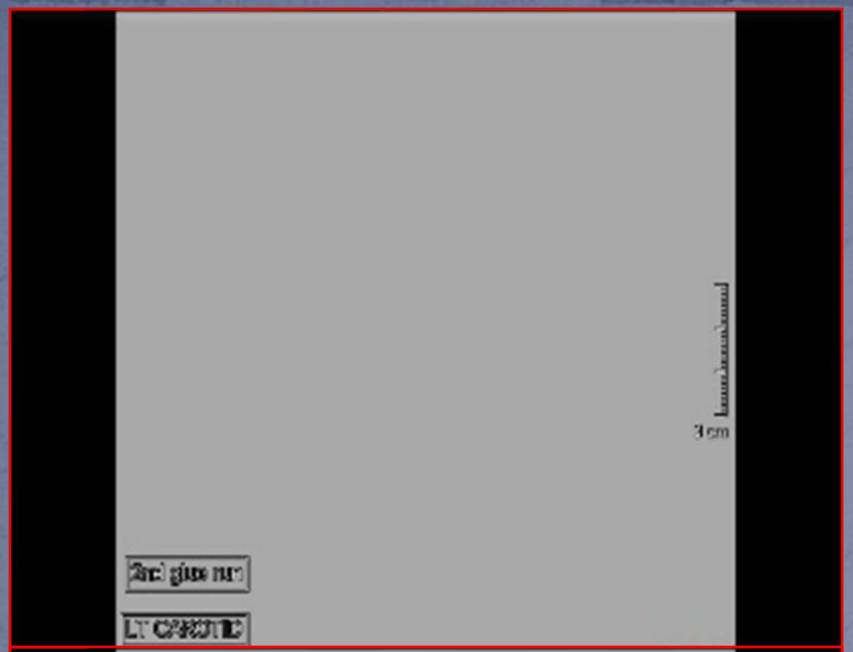


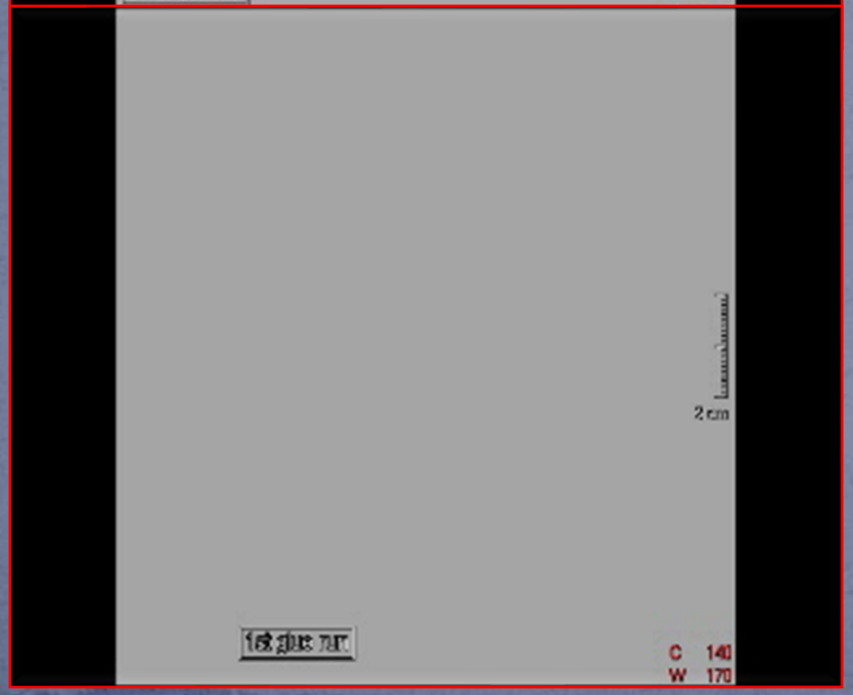
ΤΕΧΝΙΚΗ

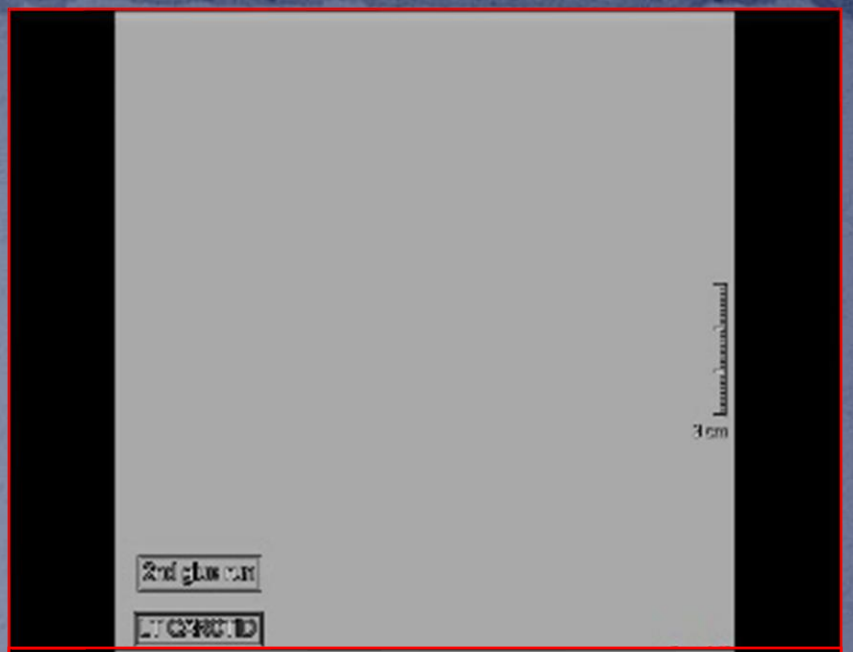
- Οδηγός καθετήρας 4F-6F
- Επιλογή από μικροκαθετήρες ροής ή απλούς:
  - Spinnaker 1.5-1.8
  - Magic 1.2-1.8
  - Sonic 1.2
  - Ultraflow etc
  - Marathon
  - (SL-10, Prowler, Rebar, Courier)

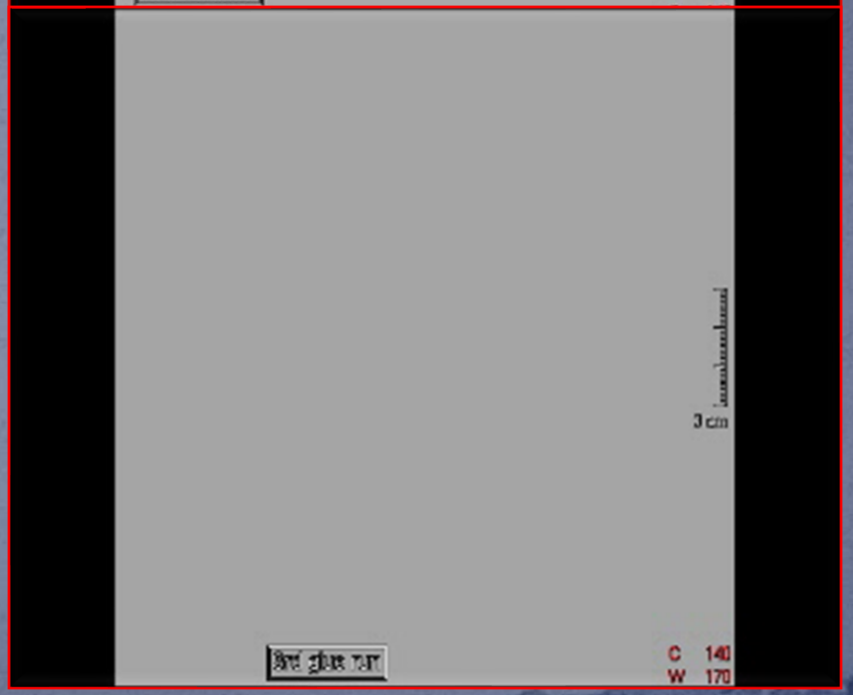


- Πάντα ελέγχουμε τον μικροκαθετήρα με ορό
- Προσπαθούμε πρώτα πλοήγηση ροής
- Καλή επιλογή αγγείου στόχου από πριν-σχεδιασμός
- Μείωση BP κατά την διάρκεια της έγχυσης (Συστ. <100mmHg)


3 cm


2 cm
C 140
W 170


3 cm


3 cm
C 140
W 170


d

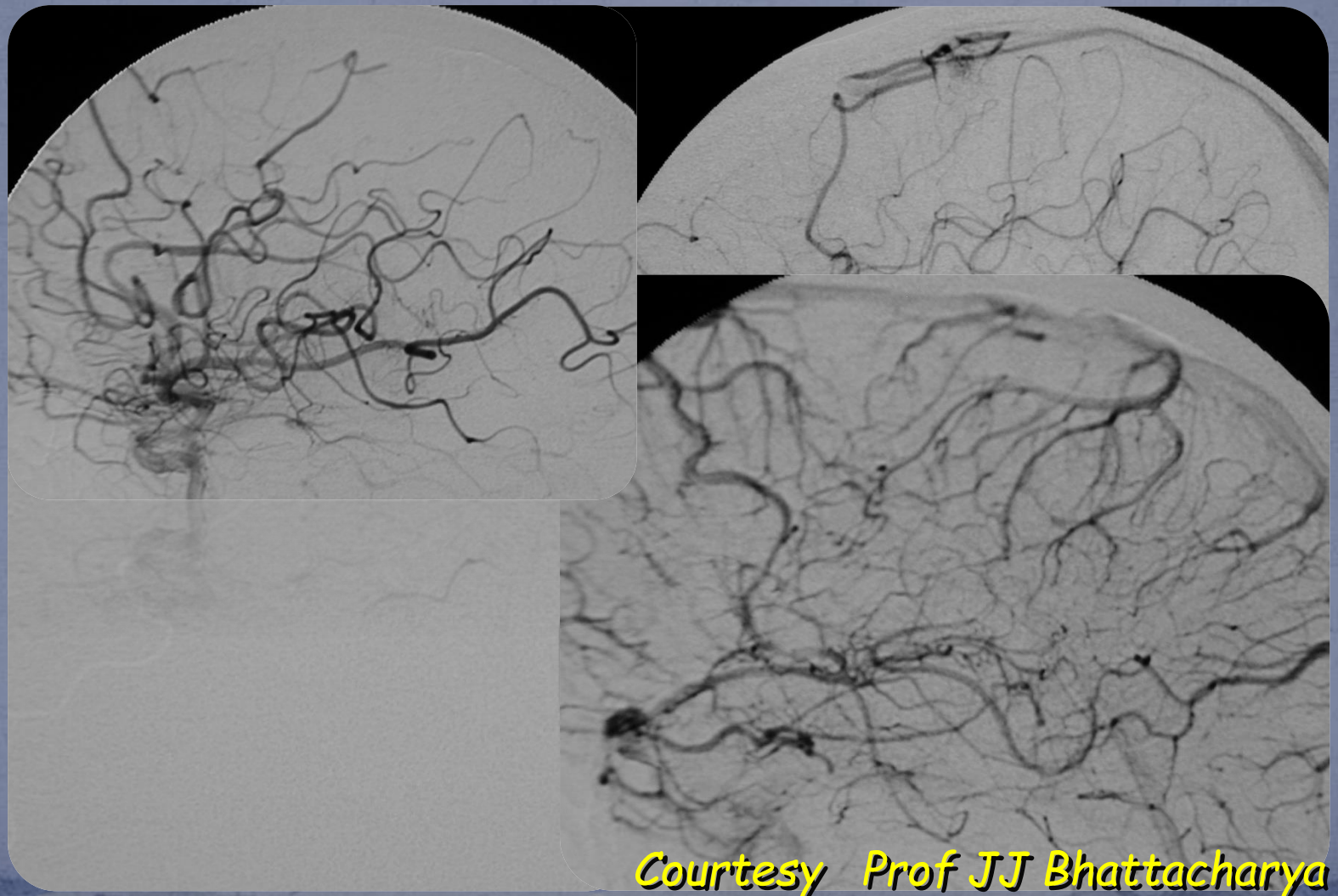
ΤΕΧΝΙΚΗ

ΠΡΟΘΕΡΑΠΕΥΤΙΚΟ ΠΛΑΝΟ

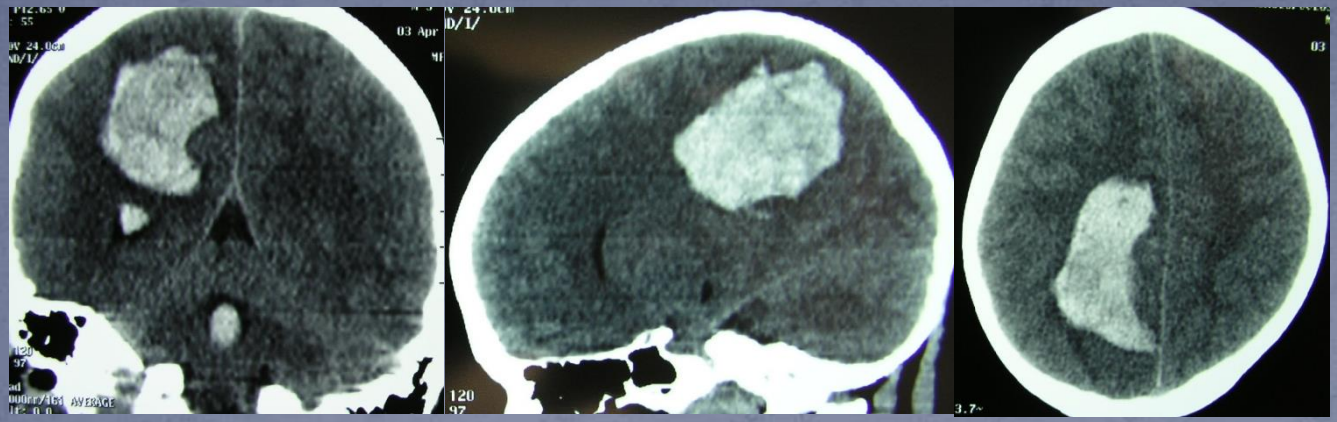
- Μέγεθος και εντόπιση
- Τροφοφόρα αγγεία και ανευρύσματα ροής
- Φυσιολογικά αγγεία
- Φωλεά-Διάχυτη ή συμπαγής
- Ενδοφωλεικά ανευρύσματα
- Φλεβική αποχέτευση
- Φλεβικοί κιρσοί και στενώσεις

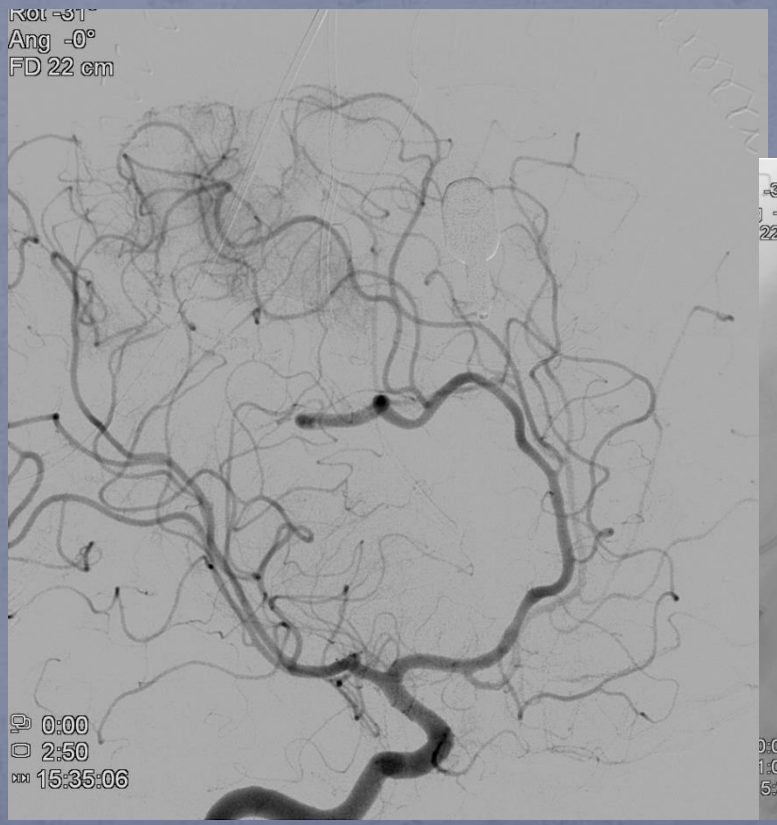
ΜΕΓΕΘΟΣ ΚΑΙ ΕΝΤΟΠΙΣΗ

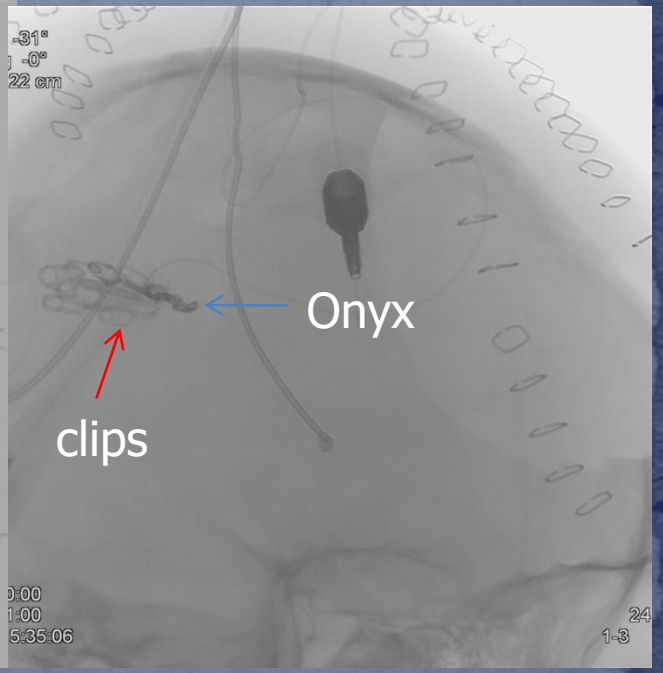
ΜΙΚΡΟ-AVM (<1CM)

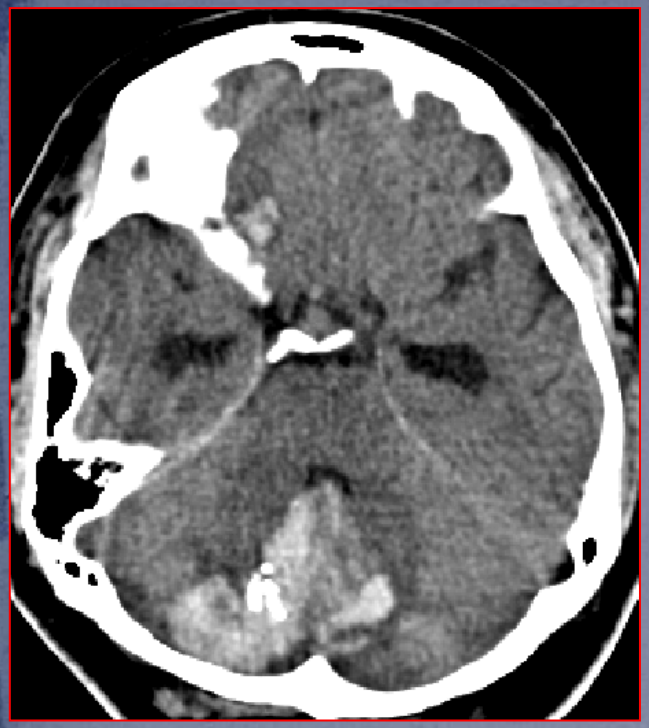


Courtesy Prof JJ Bhattacharya

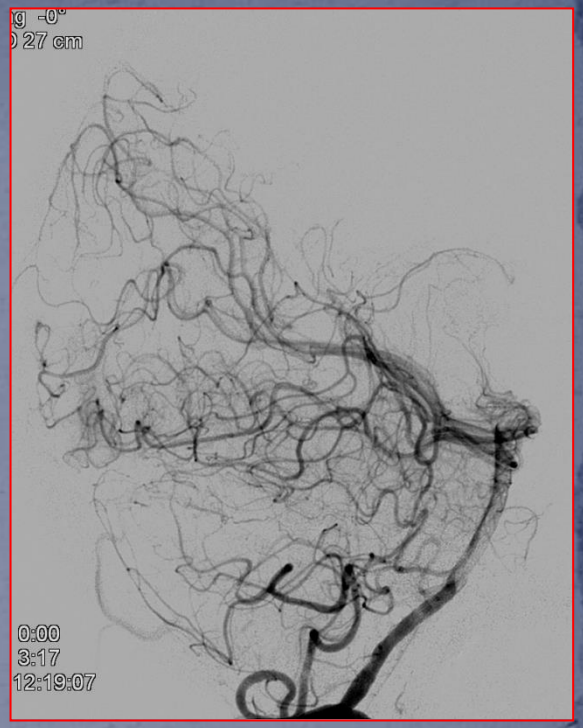


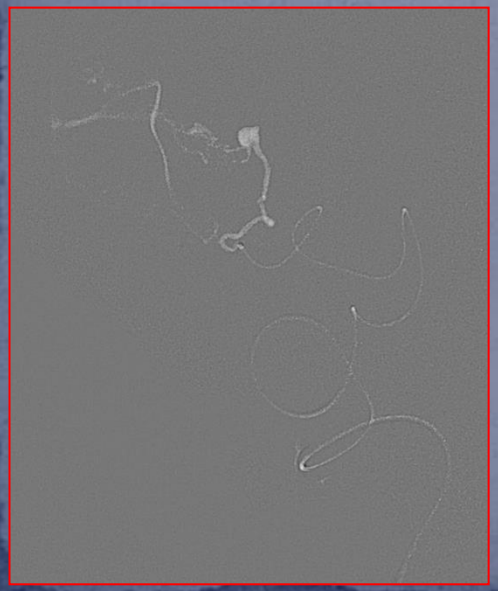

Ang -0°
FD 22 cm
0:00
2:50
15:35:06

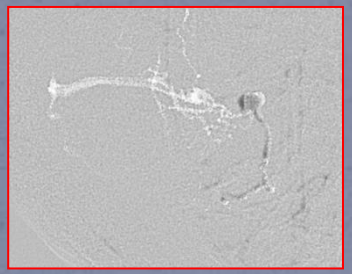

Onyx
clips

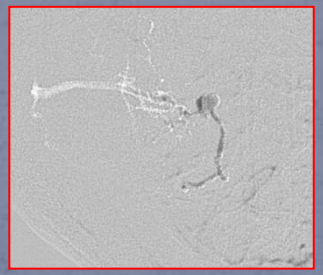


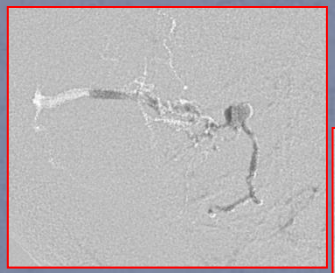

:00
:50
:41:24

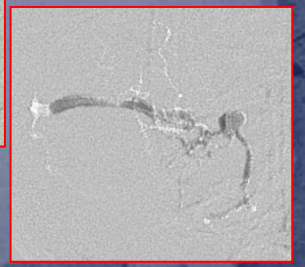

g -0°
27 cm
0:00
3:17
12:19:07



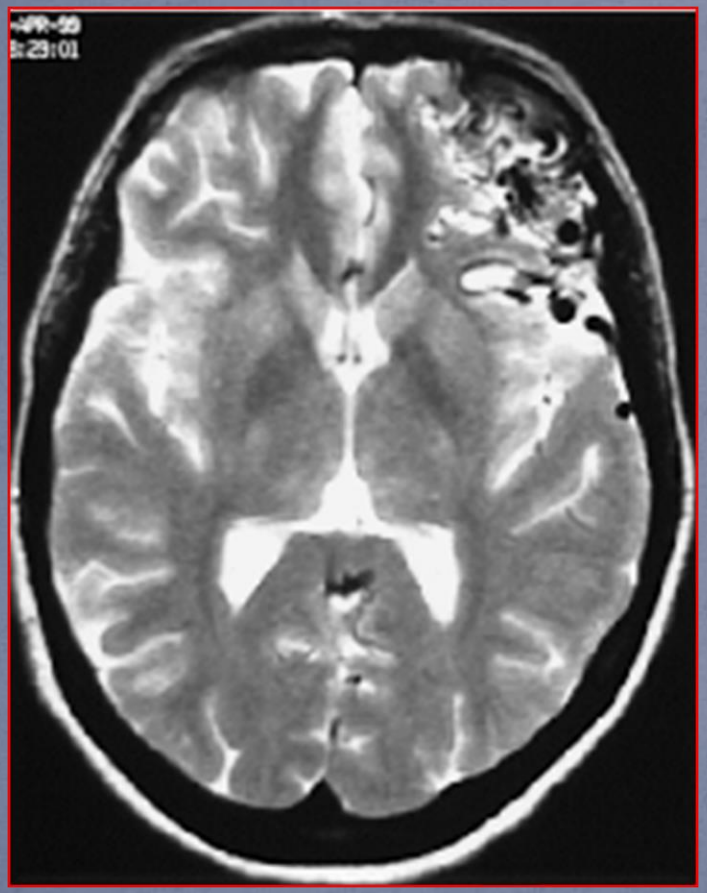




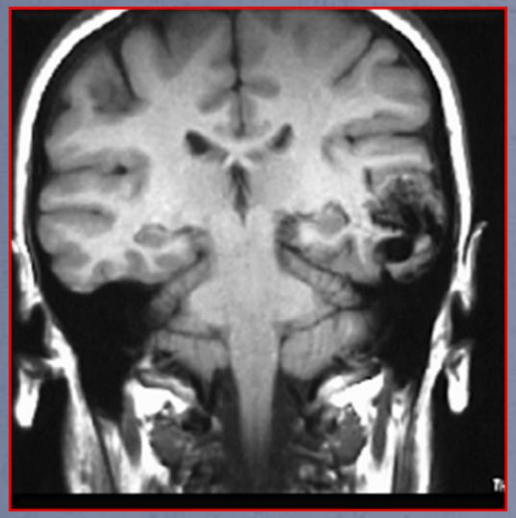


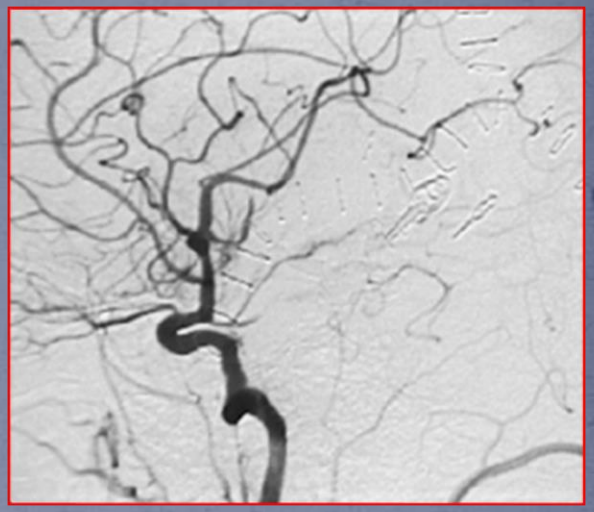


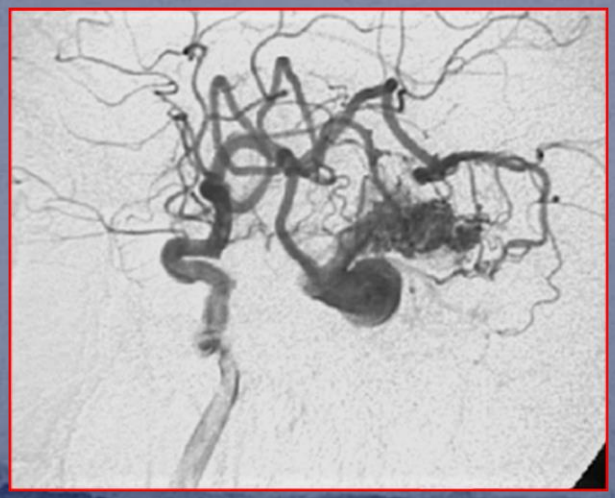
ΜΕΓΕΘΟΣ ΚΑΙ ΕΝΤΟΠΙΣΗ

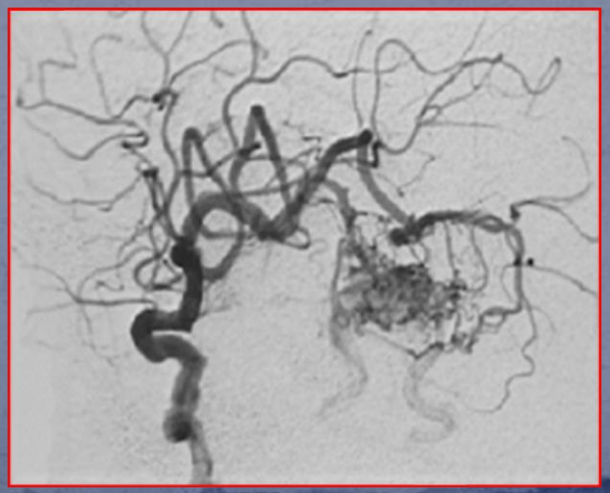


ΤΡΟΦΟΦΟΡΕΣ ΑΡΤΗΡΙΕΣ: direct v en passage



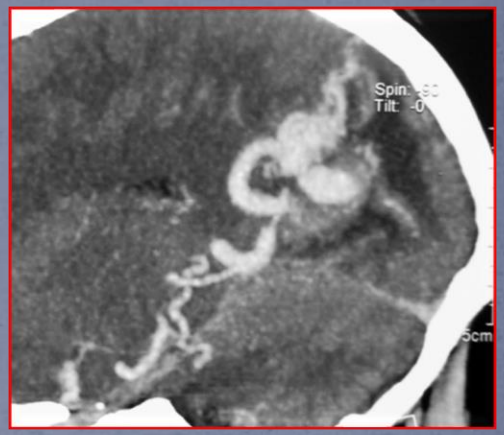


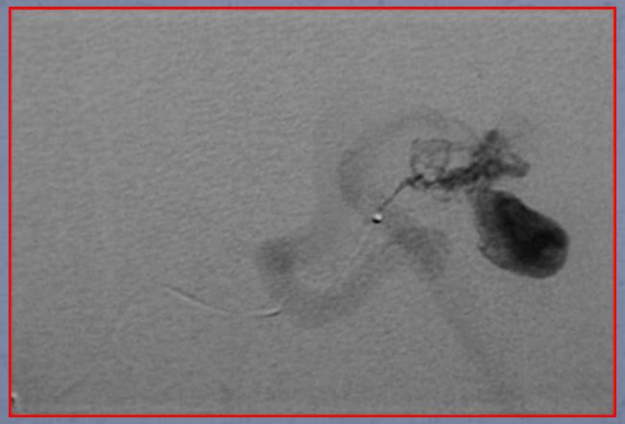




ΜΙΚΡΗ AVM ΜΕ ΑΝΕΥΡΥΣΜΑ

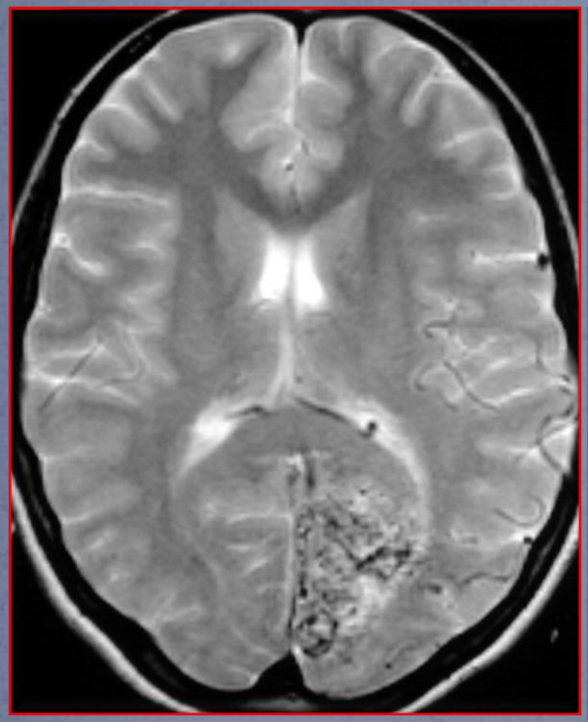
Πλάνο: Στόχος το ανεύρυσμα και μετά SRS

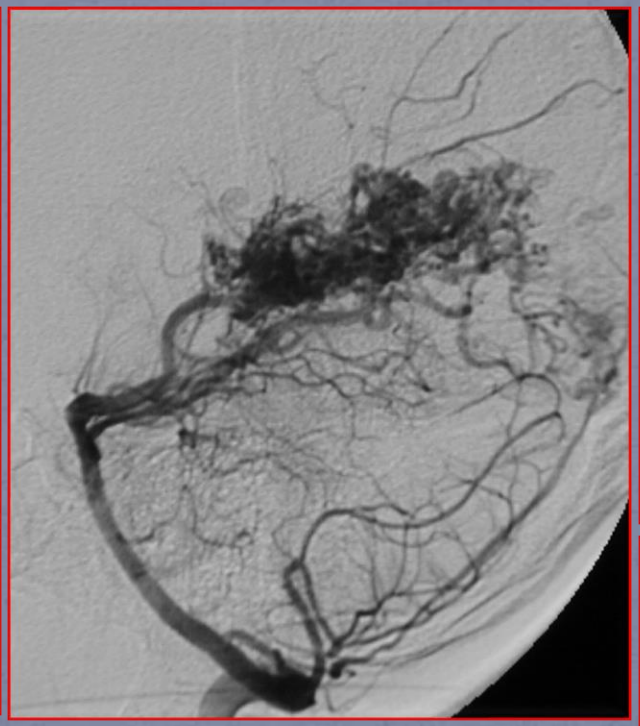


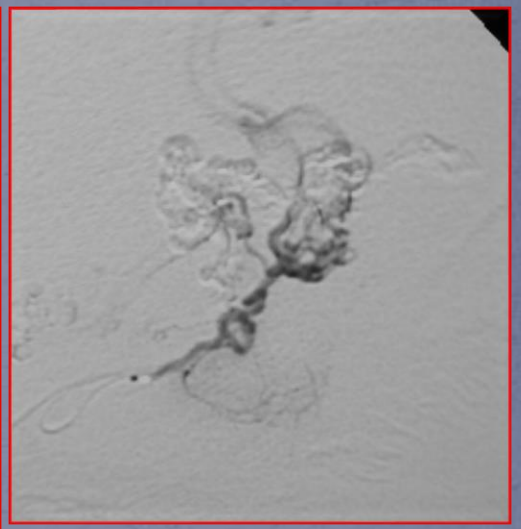


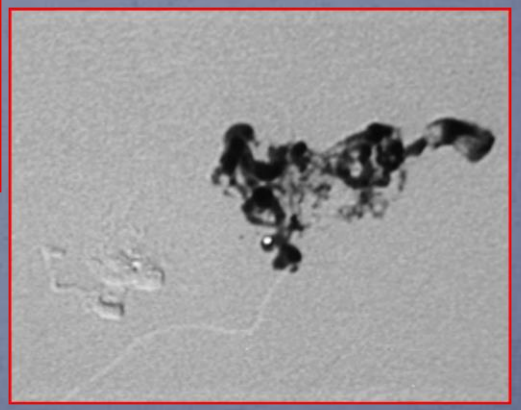
Courtesy Prof JJ Bhattacharya

ΤΡΟΦΟΦΟΡΕΣ ΑΡΤΗΡΙΕΣ:
αγγεία φυσιολογικού παρεγχύματος

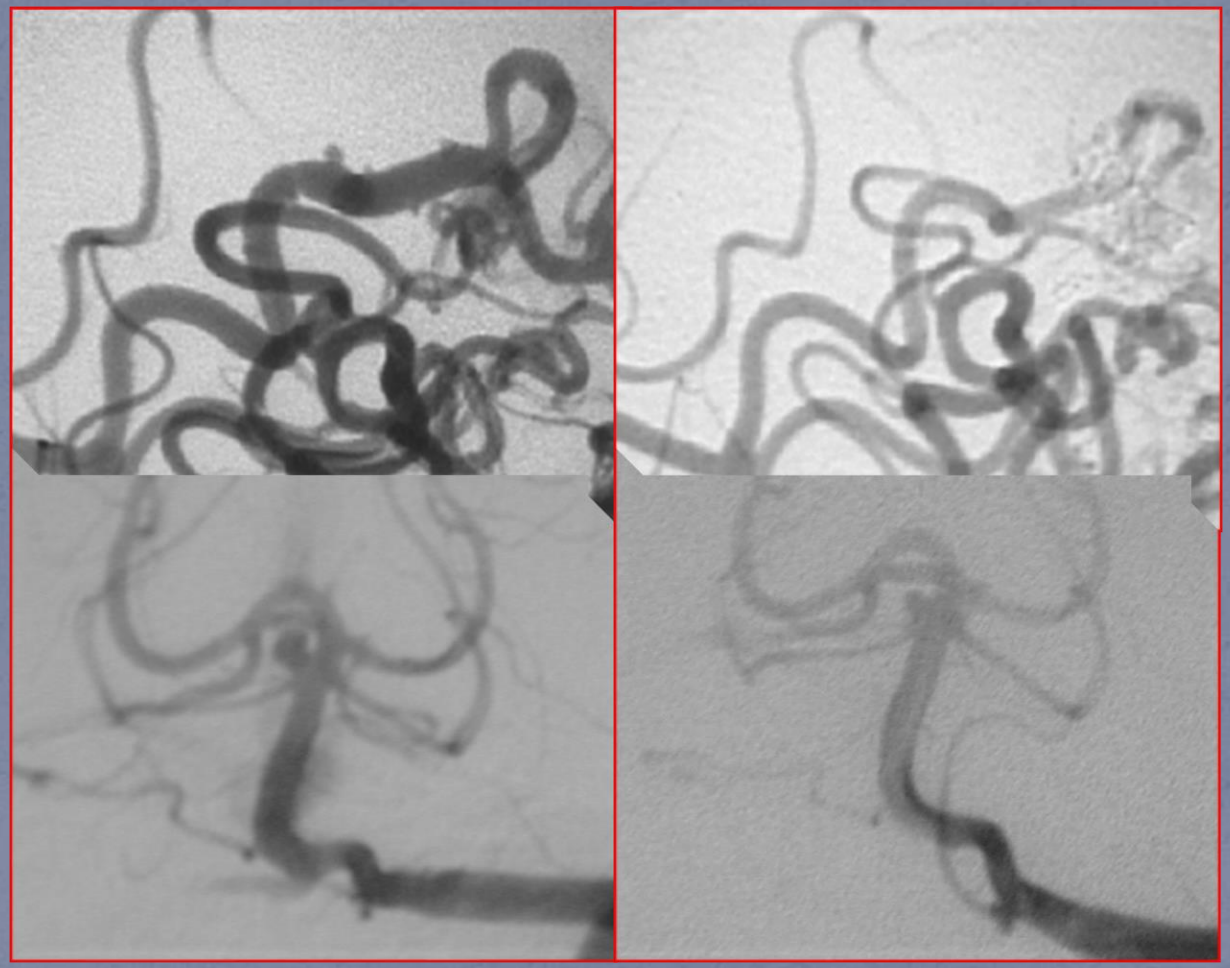






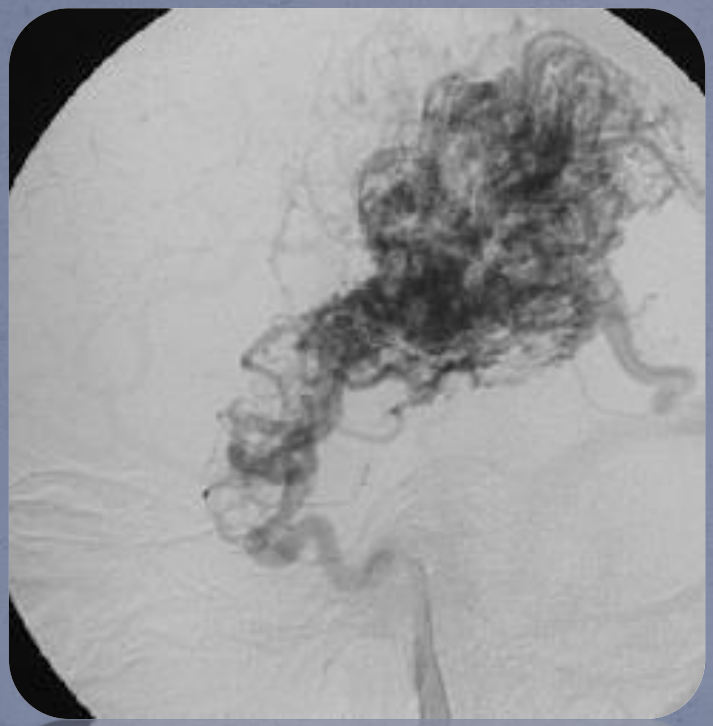


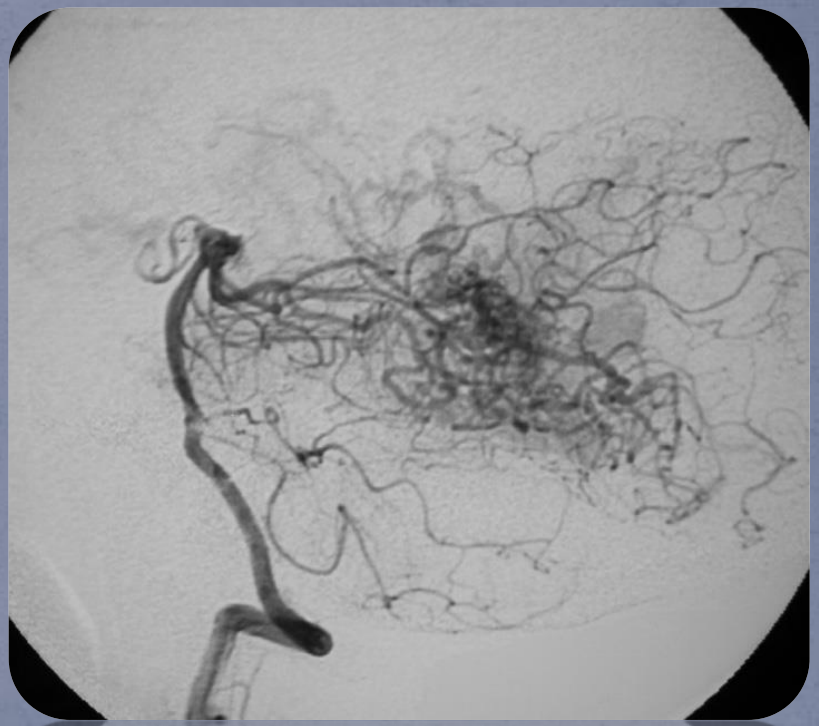
ΑΝΕΥΡΥΣΜΑΤΑ ΡΟΗΣ



Courtesy Prof JJ Bhattacharya

ΔΙΑΧΥΤΕΣ AVM-
Proliferative Angiopathy
ΠΟΤΕ ΔΕΝ ΕΠΕΜΒΑΙΝΟΥΜΕ





'...υπάρχουν μερικά πράγματα στα οποία δεν μπορείς να βοηθήσεις, αλλά δεν υπάρχει τίποτα που δεν μπορείς να κάνεις χειρότερα!'

ΣΥΜΠΕΡΑΣΜΑΤΑ

- Η θεραπεία των δυσπλασιών θα πρέπει να συζητείται και να προγραμματίζεται σε μια απολύτως εξατομικευμένη βάση
- Οργανωμένα κέντρα αναφοράς/ εξειδικευμένη ομάδα
- Ο ασφαλής εμβολισμός απαιτεί ακριβή ανάλυση της αγγειοαρχιτεκτονικής
- Η επιτυχής ενδαγγειακή θεραπεία εξαρτάται από αυτή την μορφολογία (περισσότερο από το υλικό εμβολισμού)
- Η προθεραπευτική ακτινολογική ανάλυση βοηθά στην επιλογή της κατάλληλης θεραπείας
- Οι τεχνικές δεξιότητες πρέπει να συνδυάζονται με την άριστη ανατομική γνώση
- Ο ενδαγγειακός εμβολισμός είναι μια ασφαλής και αποτελεσματική θεραπευτική παρέμβαση είτε μόνη της, είτε σε συνδυασμό με τις άλλες μεθόδους

ΑΕΕ

- Παγκόσμιο ιατρικό πρόβλημα και απόλυτα ιατρικό επείγον συμβάν
- Ο ακρογωνιαίος λίθος για την καλή έκβαση είναι η **έγκαιρη** επαναιμάτωση της ισχαιμικής περιοχής με την απομάκρυνση του θρόμβου
- Προς αυτήν την κατεύθυνση έχει γίνει μεγάλη πρόοδος
  - Έγκαιρη διάγνωση (ευαισθητοποίηση του κοινού, ΕΚΑΒ)
  - Κατάλληλη και άμεση θεραπεία
  - Αποθεραπεία

ΤΙ ΓΙΝΕΤΑΙ ΣΗΜΕΡΑ?

- **ΧΡΥΣΗ ΔΕΚΑΕΤΙΑ ΕΝΔΑΓΓΕΙΑΚΗΣ ΘΕΡΑΠΕΙΑΣ ΑΕΕ**
- **Απεικόνιση στο οξύ ΙΑΕΕ**
  - Εφαρμογή σύγχρονων τεχνικων
    - CTA/ CTP
    - αυτοματοποιημένο MR perfusion software-RAPID
- **Τεχνικές μηχανικής απομάκρυνσης θρόμβου**
  - Μεγάλες βελτιώσεις τα τελευταία χρόνια
  - Διαφορετικές συσκευές
  - Απόκτηση εμπειρίας
- **Ενδείξεις για ενδαγγειακή θεραπεία**
  - Νεώτερα δεδομένα
  - Αλλαγές στις οδηγίες

ΑΝΤΙΜΕΤΩΠΙΣΗ ΑΕΕ

- ΚΑΤΕΥΘΥΝΤΗΡΙΕΣ ΟΔΗΓΙΕΣ
  - ΘΕΡΑΠΕΙΑΣ
  - ΟΡΓΑΝΩΣΗΣ ΚΕΝΤΡΩΝ
  - ΠΟΙΟΤΙΚΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΑΝΑΓΚΑΙΟΥ ΠΡΟΣΩΠΙΚΟΥ

IV ΘΡΟΜΒΟΛΥΣΗ

ΠΡΕΠΕΙ ΝΑ ΓΙΝΕΤΑΙ I (A-B) EVIDENCE

Σε ασθενείς που έρχονται <3 - 4,5* h

*Ηλικία ≤80 y, χωρίς ιστορικό διαβήτης, προηγούμενου ισχαιμικού ή λήψης αντιπηκτικών από του στόματος, NIHS score ≤25

Σε ασθενείς με wake-up stroke και DW/FLAIR mismatch (2020)

•ΔΕΝ ΚΑΘΥΣΤΕΡΟΥΜΕ ΓΙΑ ΤΥΧΟΝ ΚΛΙΝΙΚΗ ΒΕΛΤΙΩΣΗ

•ΟΧΙ ΧΟΡΗΓΗΣΗ ΣΕ ΑΣΘΕΝΕΙΣ ΠΟΥ ΕΛΑΒΑΝ ΘΕΡΑΠΕΥΤΙΚΗ ΔΟΣΗ ΧΑΜΗΛΟΥ ΜΟΡΙΑΚΟΥ ΒΑΡΟΥΣ ΗΠΑΡΙΝΗ ΤΟ ΠΡΟΗΓΟΥΜΕΝΟ 24ΩΡΟ

ΜΠΟΡΕΙ ΝΑ ΔΙΚΑΙΟΛΟΓΗΘΕΙ IIb (B) EVIDENCE

Σε ασθενείς που έρχονται 3-4,5* h

ΚΑΙ

Ηλικία ≤80 y, χωρίς ιστορικό διαβήτης, προηγούμενου ισχαιμικού ή λήψης αντιπηκτικών από του στόματος, NIHS score ≤25

ΑΝ

πληρούνται τα λοιπά κριτήρια CT

ΜΗΧΑΝΙΚΗ ΘΡΟΜΒΕΚΤΟΜΗ

ΠΡΕΠΕΙ ΝΑ ΓΙΝΕΤΑΙ I (A) EVIDENCE

Σε συνδυασμό με/χωρίς IV θρομβόλυση για ασθενείς που έρχονται <4,5 h/6h και απόφραξη μεγάλου αγγείου πρόσθιας κυκλοφορίας (M1-M2 κλάδοι) ή βασικής αρτηρίας, NIHS score>5, ASPECT score>5

CTA

Σε επιλεγμένους ασθενείς που έρχονται >6 h …< 16 h (ισχαιμική-νεκρωτική ανακολουθία)

CTA-CTP

MRP-DW

RAPID software

ΜΠΟΡΕΙ ΝΑ ΔΙΚΑΙΟΛΟΓΗΘΕΙ IIb (B-C) EVIDENCE

Σε συνδυασμό με/χωρίς IV θρομβόλυση για ασθενείς που έρχονται <4,5 h/6h και απόφραξη μικρού αγγείου πρόσθιας κυκλοφορίας ή

οπίσθιας κυκλοφορίας

Ή

Ασθενείς με NIHS score 0-5 και σημαντικό νευρολογικό έλλειμμα ή επιδείνωση νευρολογικής εικόνας παρά την θρομβόλυσης

ASA Policy Statement

Recommendations for the Establishment of Stroke Systems of Care: A 2019 Update

A Policy Statement From the American Stroke Association

Opeolu Adeoye, MD, MS, FAHA, Chair; Karin V. Nyström, RN, MSN, FAHA; Dileep R. Yavagal, MD; Jean Luciano, CRNP; Raul G. Nogueira, MD; Richard D. Zorowitz, MD; Alexander A. Khalessi, MD, MS, FAHA; Cheryl Bushnell, MD, MHS, FAHA; William G. Barsan, MD; Peter Panagos, MD; Mark J. Alberts, MD, FAHA; A. Colby Tiner, MA; Lee H. Schwamm, MD, FAHA; Edward C. Jauch, MD, MS, FAHA

Stroke Ιούλιος 2019

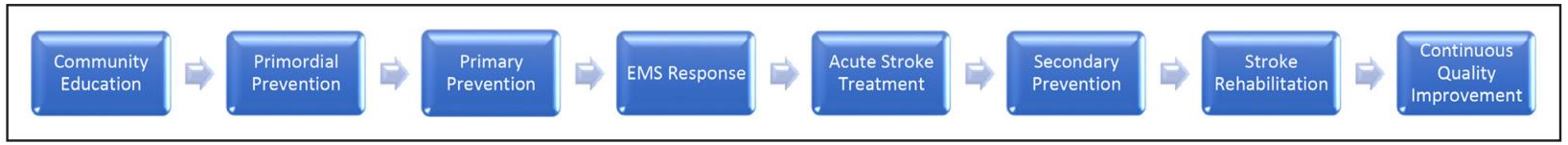


Figure 1. The 8 domains of a stroke system of care. EMS indicates emergency medical services.

Table 1. Levels and Capabilities of Hospital Stroke Designation

	ASRH	PSC	TSC	CSC
Location	Likely rural	Likely urban/suburban	Likely urban	Likely urban
Stroke team accessible/available 24 h/d, 7 d/wk	Yes	Yes	Yes	Yes
Noncontrast CT available 24 h/d, 7 d/wk	Yes	Yes	Yes	Yes
Advanced imaging (CTA/CTP/MRI/MRA/MRP) available 24 h/d, 7 d/wk	No	Yes	Yes	Yes
Intravenous alteplase capable	Yes	Yes	Yes	Yes
Thrombectomy capable	No	Possibly	Yes	Yes
Diagnoses stroke pathogenesis/manage poststroke complications	Unlikely	Yes	Yes	Yes
Admits hemorrhagic stroke	No	Possibly	Possibly	Yes
Clips/coils ruptured aneurysms	No	Possibly	Possibly	Yes
Dedicated stroke unit	No	Yes	Yes	Yes
Dedicated neurocritical care unit/ICU	No	Possibly	Possibly	Yes

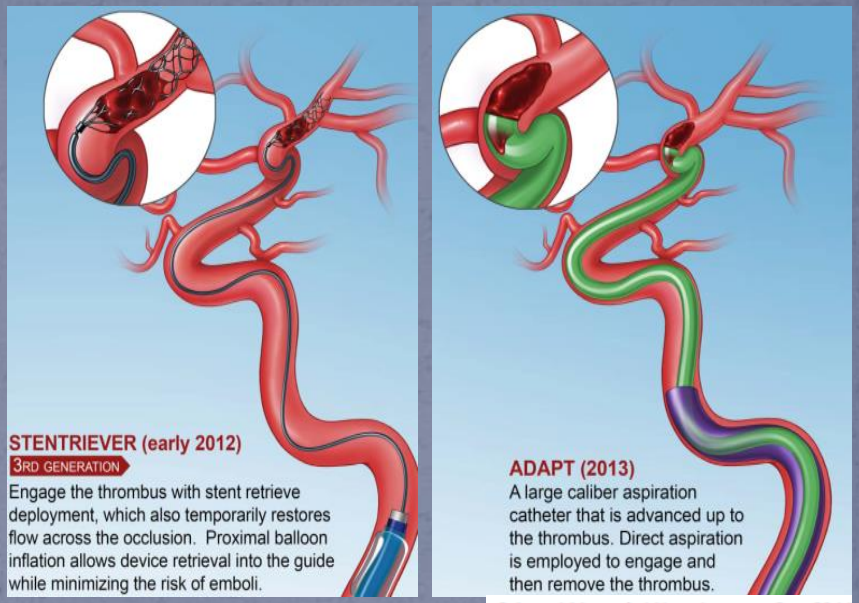
ASRH indicates acute stroke-ready hospital; CSC, comprehensive stroke center; CT, computed tomography; CTA, computed tomography angiography; CTP, computed tomography perfusion; ICU, intensive care unit; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; MRP, magnetic resonance perfusion; PSC, primary stroke center; and TSC, thrombectomy-capable stroke center.

ΕΝΔΑΓΓΕΙΑΚΗ ΘΕΡΑΠΕΙΑ ΙΣΧΑΙΜΙΚΟΥ ΑΕΕ

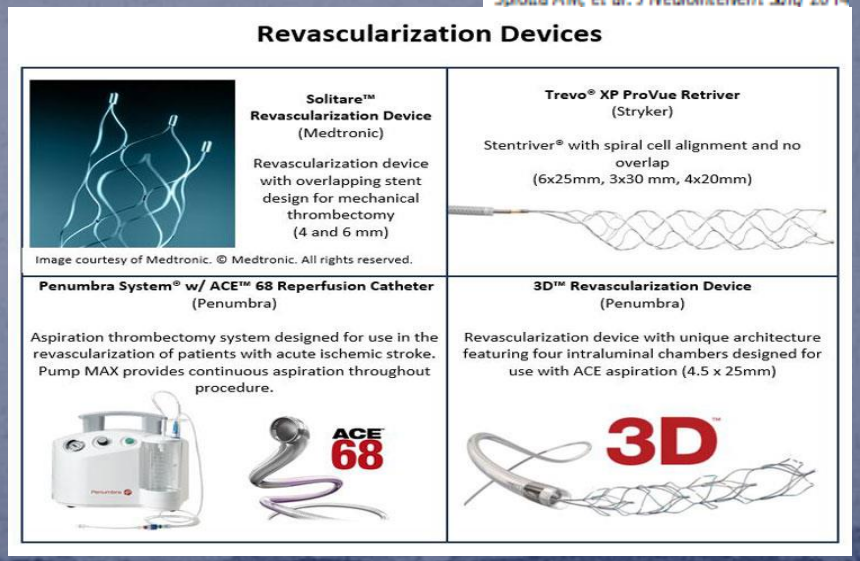
- **ΧΡΥΣΗ ΔΕΚΑΕΤΙΑ**
- **Απεικόνιση στο οξύ ΙΑΕΕ**
  - Εφαρμογή σύγχρονων τεχνικων
    - CTA/ CTP
    - αυτοματοποιημένο MR perfusion software-RAPID
- **Τεχνικές μηχανικής απομάκρυνσης θρόμβου**
  - Μεγάλες βελτιώσεις τα τελευταία χρόνια
  - Διαφορετικές συσκευές - τεχνικές
  - Απόκτηση εμπειρίας
- **Ενδείξεις για ενδαγγειακή θεραπεία**
  - Νεώτερα δεδομένα
  - Αλλαγές στις οδηγίες (επικαιροποίηση Δεκ. 2019)

ΜΗΧΑΝΙΚΗ ΘΡΟΜΒΕΚΤΟΜΗ

- Διαδικασία μηχανικής απομάκρυνσης του θρόμβου
  - Θρομβοαναρρόφηση
  - Με τη βοήθεια μεταλλικής ενδοπρόθεσης
  - Συνδυασμός



Spiotta A.M. et al. J Neurointervent Surg 2014



Stroke

AHA/ASA GUIDELINE

Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

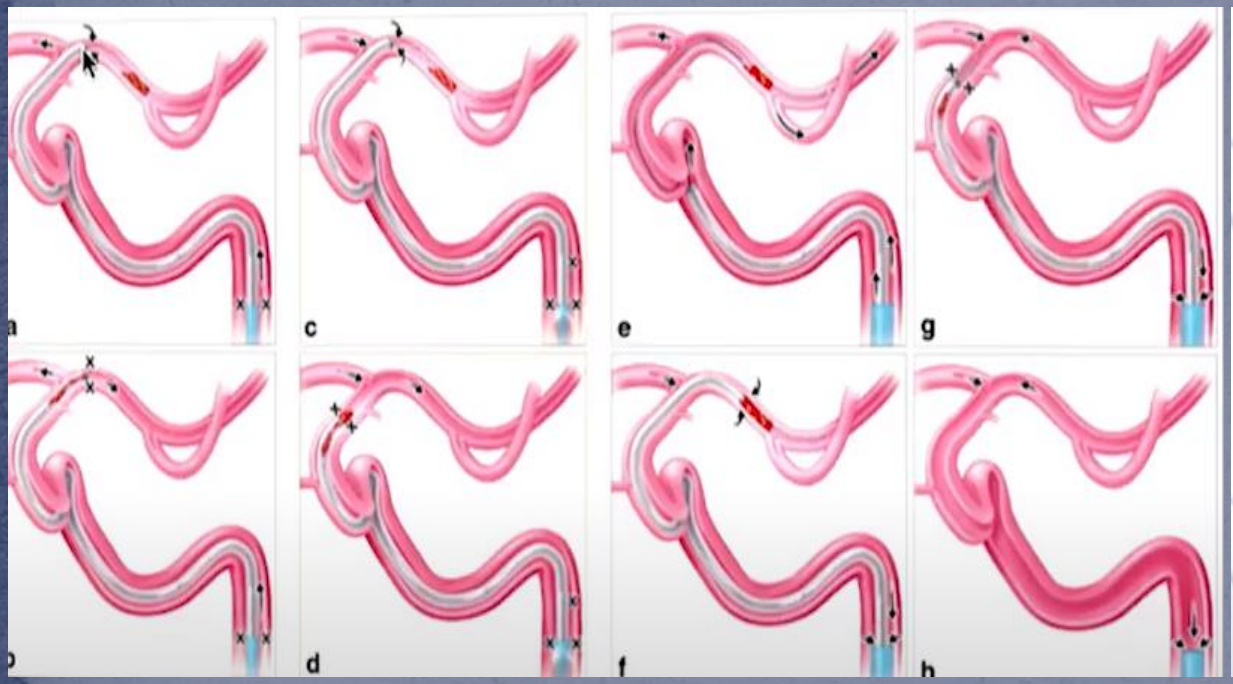
See related article, p 3331

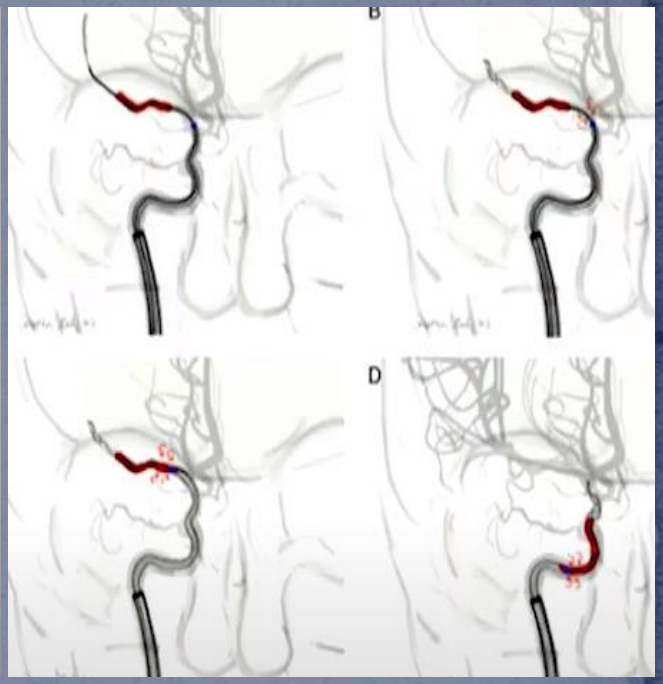
William J. Powers, MD, FAHA, Chair, Alejandro A. Rabinstein, MD, FAHA, Vice Chair, Teri Ackerson, BSN, RN, Opeolu M. Adeoye, MD, MS, FAHA, Nicholas C. Bambakidis, MD, FAHA, Kyra Becker, MD, FAHA, José Biller, MD, FAHA, Michael Brown, MD, MSc, Bart M. Demaerschalk, MD, MSc, FAHA, Brian Hoh, MD, FAHA, Edward C. Jauch, MD, MS, FAHA, Chelsea S. Kidwell, MD, FAHA, Thabele M. Leslie-Mazwi, MD, Bruce Ovbiagele, MD, MSc, MAS, MBA, FAHA, Phillip A. Scott, MD, MBA, FAHA, Kevin N. Sheth, MD, FAHA, Andrew M. Southerland, MD, MSc, FAHA, Deborah V. Summers, MSN, RN, FAHA, and David L. Tirschwell, MD, MSc, FAHA

*Stent-retrievers OR direct thrombo-aspiration (mTICI 2b/3)

ΜΗΧΑΝΙΚΗ ΘΡΟΜΒΕΚΤΟΜΗ- ΤΕΧΝΙΚΕΣ

SOLUMBRA ARTS SAVE CAPTIVE



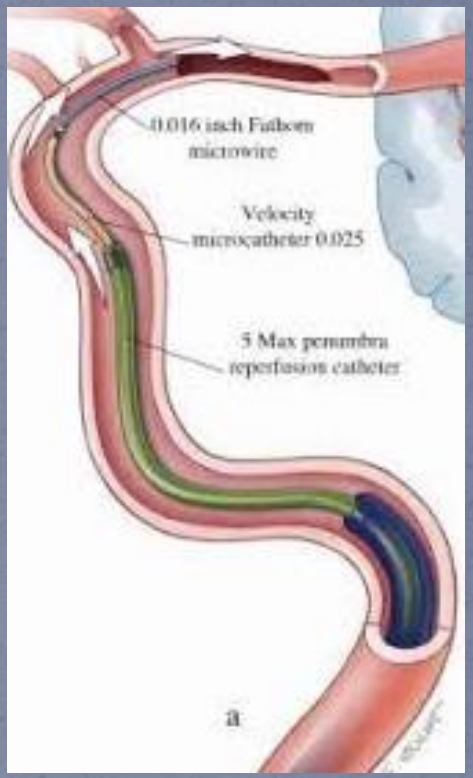


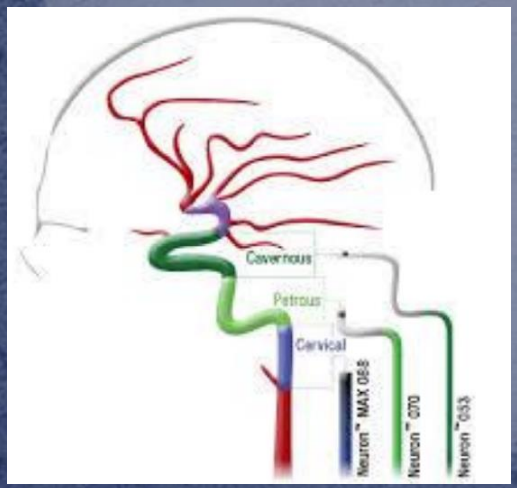
McTaggart RA et al J Neurointervent Surg 2016

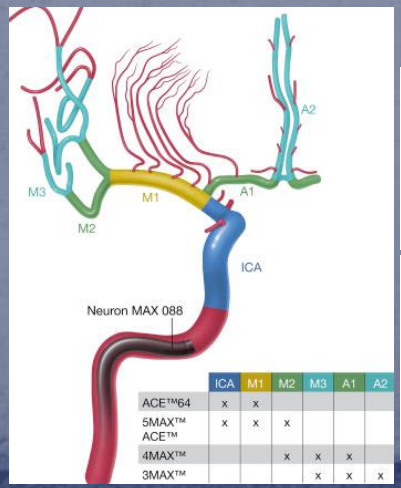
Volker et al Clin Neuroradiol 2017

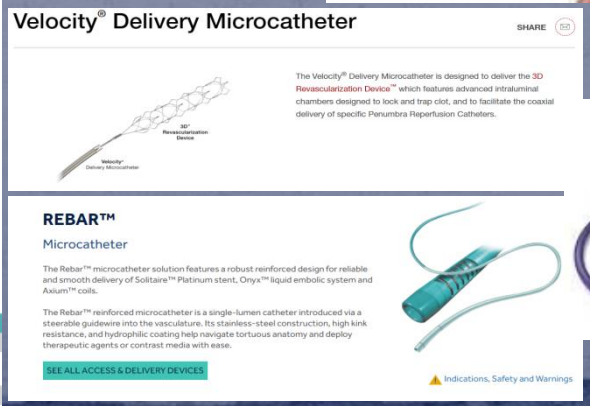
ΜΗΧΑΝΙΚΗ ΘΡΟΜΒΕΚΤΟΜΗ

- Συνήθως μηριαία πρόσβαση
- Ομοαξονικό σύστημα
  - Θηκάρι (8 Fr)
  - Οδηγός καθετήρας
  - Καθετήρας θρομβεκτομής
  - Ενδιάμεσος μικροκαθετήρας
  - Μικροσύρμα









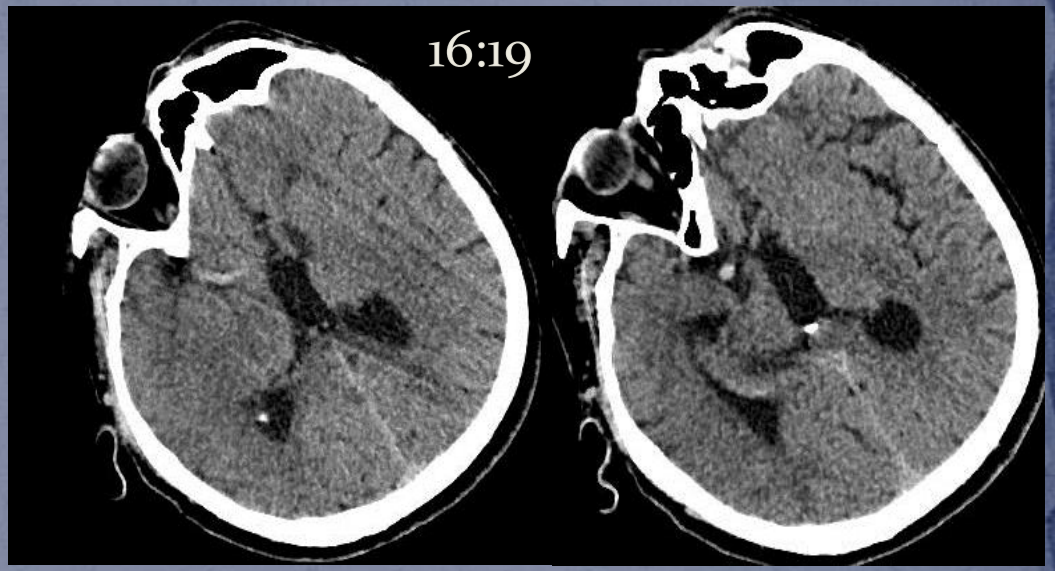
ΠΡΑΚΤΙΚΑ ΔΙΛΗΜΜΑΤΑ

- Ασθενής ξύπνιος ?/ υπό μέθη? / υπό ΓΑ?
- Κοντό ή μακρύ θηκάρι? 6, 8 ή 9 Fr
- Οδηγός καθετήρας απλός ή με αποφρακτικό μπαλόνι
- Ενδιάμεσος καθετήρας?
- Θρομβοαναρρόφηση ? Stent ?
- Αναρρόφηση με αντλία? μηχανική? Από πόσα σημεία?
- Συνδυαστική φαρμακολογική θεραπεία (θρομβόλυση? Aggrastat? Nimodipine?)
- Πότε σταματάμε??

ΠΑΡΑΓΟΝΤΕΣ ΠΟΥ ΕΠΗΡΕΑΖΟΥΝ ΤΟ ΑΠΟΤΕΛΕΣΜΑ ΤΗΣ ΕΝΔΑΡΤΗΡΙΑΚΗΣ ΘΕΡΑΠΕΙΑΣ		
ΣΧΕΤΙΖΟΜΕΝΟΙ ΜΕ ΤΟΝ ΑΣΘΕΝΗ	**ΣΧΕΤΙΖΟΜΕΝΟΙ ΜΕ ΤΑ ΑΠΕΙΚΟΝΙΣΤΙΚΑ ΕΥΡΗΜΑΤΑ**	**ΣΧΕΤΙΖΟΜΕΝΟΙ ΜΕ ΤΙΣ ΔΟΜΕΣ**
ΗΛΙΚΙΑ	CT/CTA	ΜΕΡΑ / ΝΥΧΤΑ ΚΑΘΗΜΕΡΙΝΗ / ΣΚ
ΣΥΝ-ΝΟΣΗΡΟΤΗΤΑ	ΠΡΟΣΘΙΑ Ή ΟΠΙΣΘΙΑ ΚΥΚΛΟΦΟΡΙΑ	ΑΠΟΣΤΑΣΗ ΑΠΟ ΤΟ ΝΟΣΟΚΟΜΕΙΟ
ΚΛΙΝΙΚΗ ΣΟΒΑΡΟΤΗΤΑ (NIHSS)	ΜΕΓΕΘΟΣ ΘΡΟΜΒΟΥ / ΠΑΡΑΠΛΕΥΡΗ ΚΥΚΛΟΦΟΡΙΑ	ΕΜΠΕΙΡΙΑ ΟΜΑΔΑΣ
ΧΡΟΝΟΣ ΑΠΟ ΤΗΝ ΕΝΑΡΞΗ ΤΩΝ ΣΥΜΠΤΩΜΑΤΩΝ	ΑΓΓΕΙΟΑΡΧΙΤΕΚΤΟΝΙΚΗ ΤΟΞΟΥ-ΕΝΔΟΚΡΑΝΙΩΝ ΑΓΓΕΙΩΝ	ΔΙΑΘΕΣΙΜΟΤΗΤΑ ΑΓΓΕΙΟΓΡΑΦΟΥ

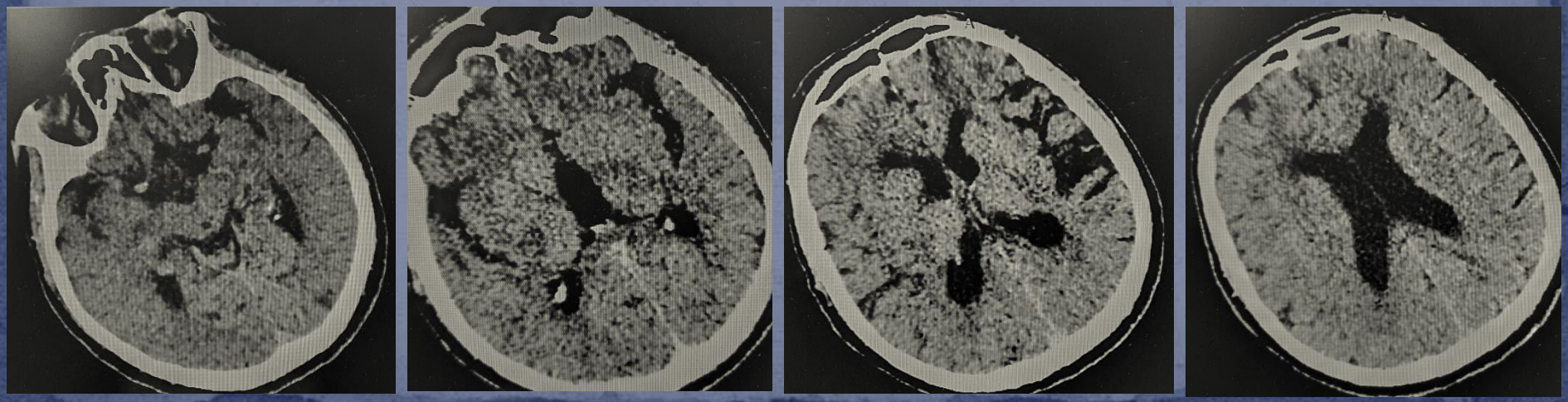
ΠΑΡΟΥΣΙΑΣΗ ΚΛΙΝΙΚΟΥ ΠΕΡΙΣΤΑΤΙΚΟΥ

- Άνδρας 62 ετών
- 3.45 h AP ημιπληγία
- NIHSS = 17



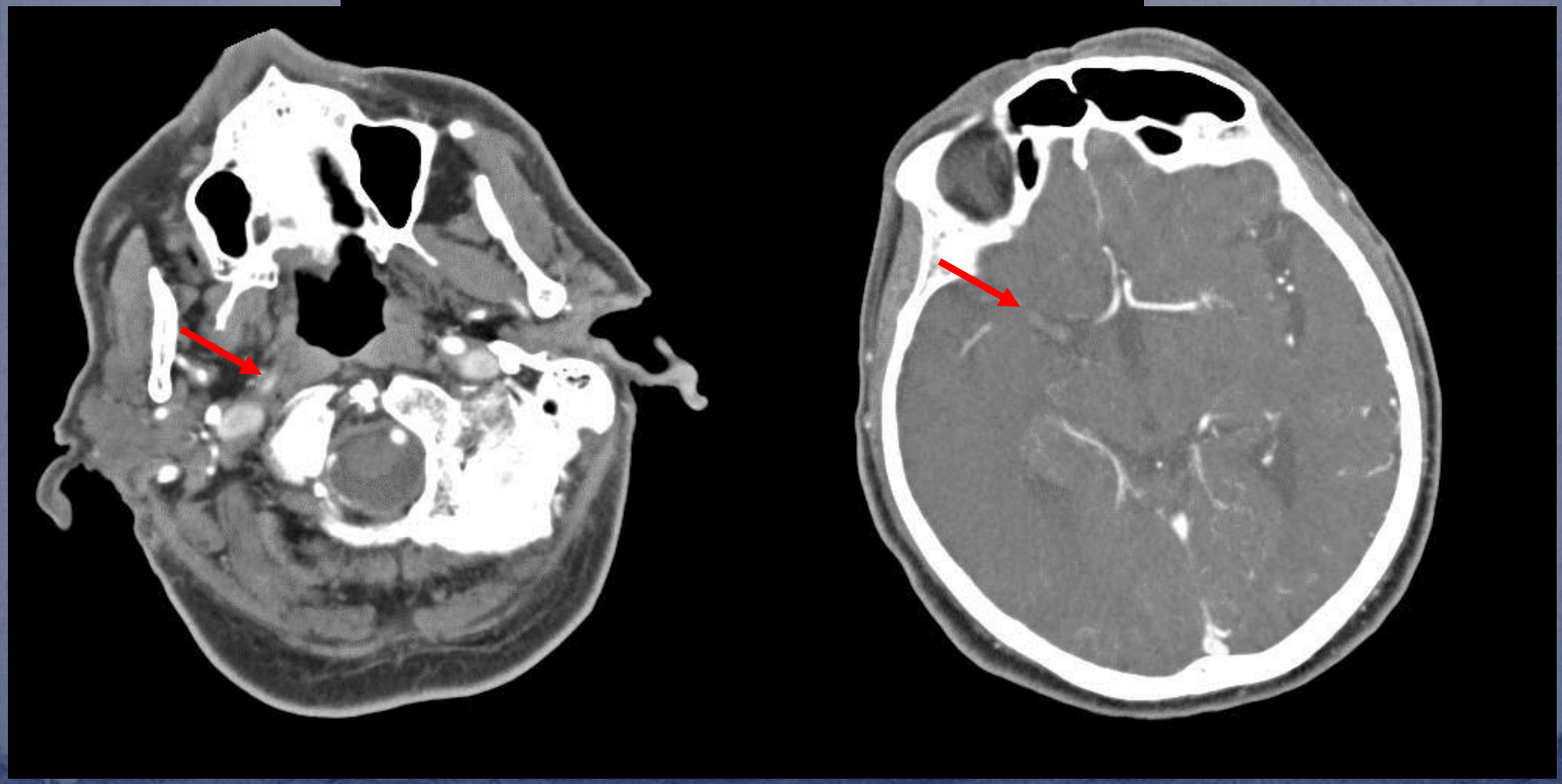
CT εγκεφάλου

Υπέρπυκνη ΔΕ έσω καρωτίδα (τελικό εξωκρανιακό και ενδοκράνιο τμήμα) και M1 τμήμα ΔΕ μέσης εγκεφαλικής
Ασθενώς υπόπυκνη περιοχή ΔΕ βρεγματικά με ασαφοποίηση ορίων φαιάς – λευκής ουσίας

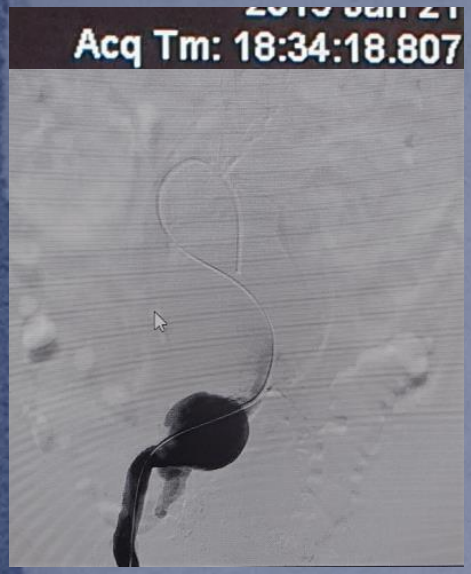


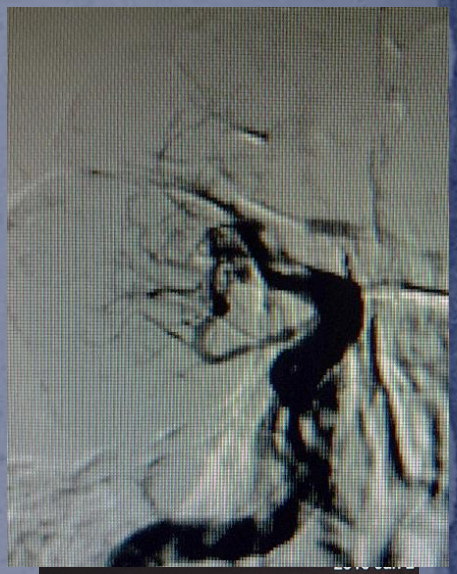
ΠΑΡΟΥΣΙΑΣΗ ΚΛΙΝΙΚΟΥ ΠΕΡΙΣΤΑΤΙΚΟΥ

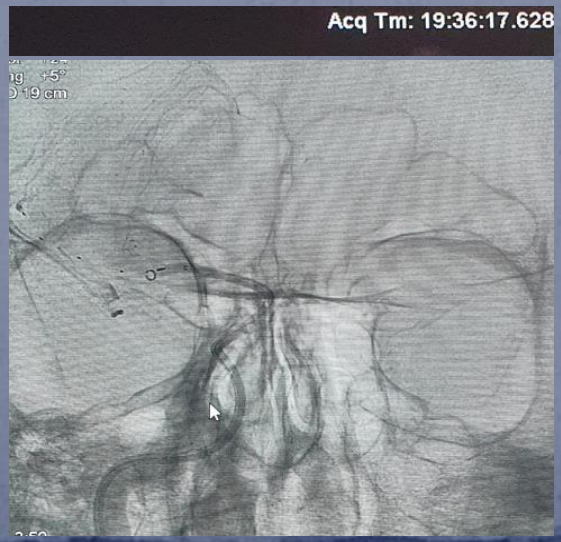
CTA εγκεφάλου - καρωτίδων



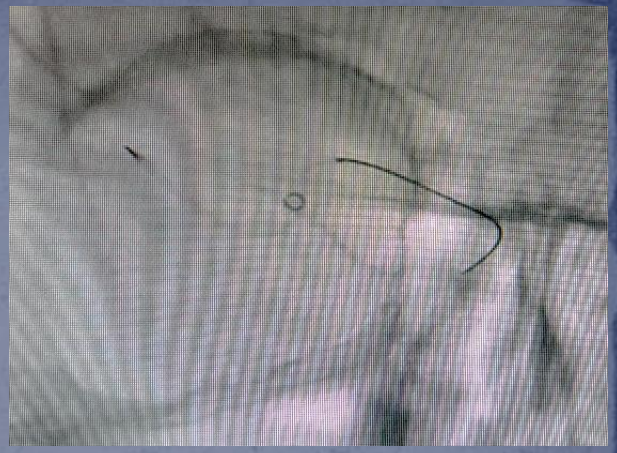
- Alteplase (7,2mg bolus + 64,8mg infusion in 1 h)
- +
- Μηχανική θρομβεκτομή (ξεκίνησε 6 h μετά την έναρξη της προσβολής)








Acq Tm: 20:02:09.928
+11°
+5°
7 cm

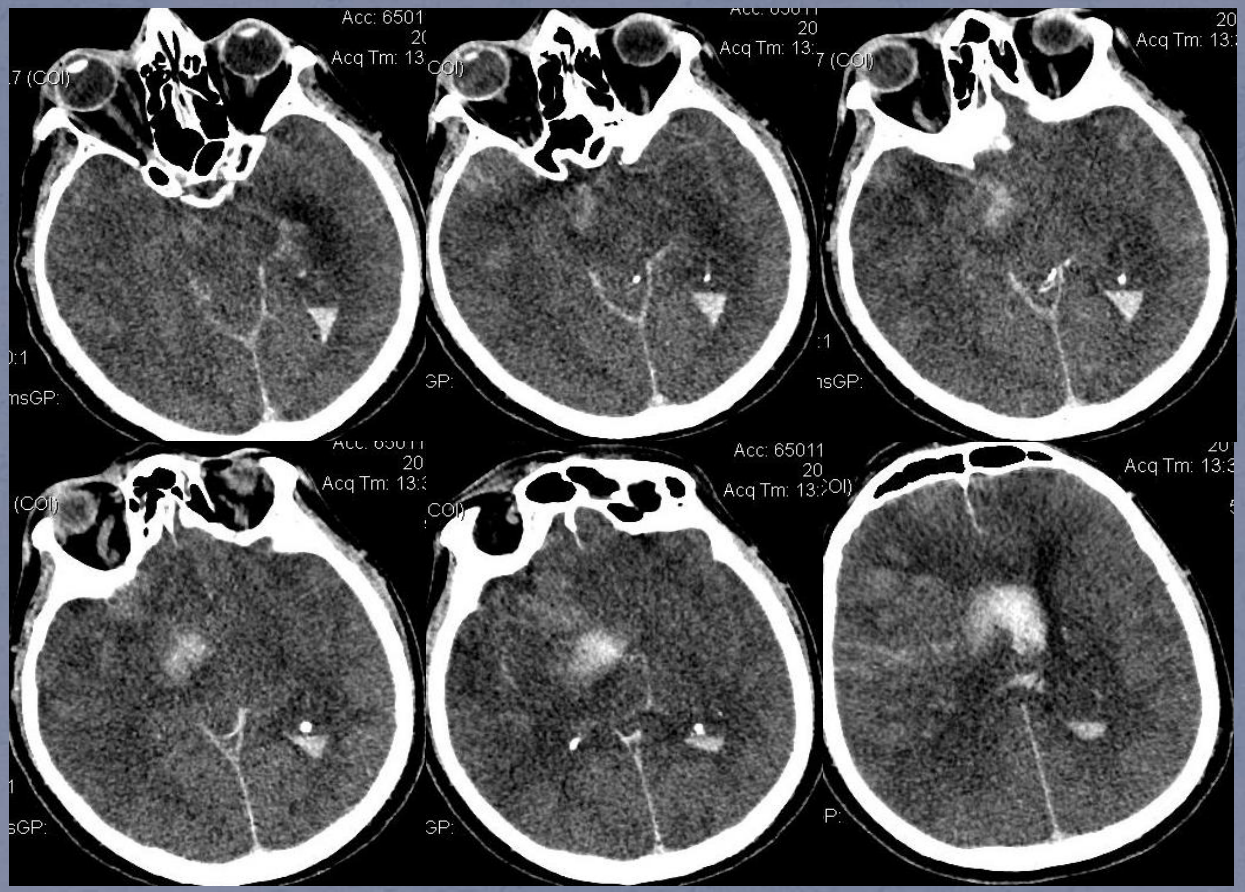



m: 21/58 (Fr: 21/29)
Acq Tm: 20:19:3
Mag: 0.6x

ΠΑΡΟΥΣΙΑΣΗ ΚΛΙΝΙΚΟΥ ΠΕΡΙΣΤΑΤΙΚΟΥ

- Χωρίς κλινική βελτίωση, NIHSS μετά τη θρομβεκτομή = 17
- Κλινική σταθερότητα για τις επόμενες 8 ώρες (διατήρηση σταθερής ΑΠ χωρίς φαρμακευτική παρέμβαση, σταθερή GCS - NIHSS)
- Λόγω διαταραχής επιπέδου, απορρύθμιση ΑΠ 8 ώρες μετά το πέρας της διαδικασίας → ΜΕΘ, διασωλήνωση

ΝΕΑ ΑΞΟΝΙΚΗ ΤΟΜΟΓΡΑΦΙΑ 8 ΩΡΕΣ ΜΕΤΑ ΤΟ ΠΕΡΑΣ ΤΗΣ ΘΡΟΜΒΕΚΤΟΜΗΣ



Ο ασθενής κατέληξε 2 μέρες μετά...

L sided hemiplegia <2h

Thrombus extraction

MECHANICAL THROMBECTOMY

*Stent-retrievers OR direct thrombo-aspiration (mTICI 2b/3)

SHOULD BE PERFORMED ***I (A) EVIDENCE***

In combination with/without IV thrombolysis for pts* admitted <4,5 h/6h and anterior circulation LVO

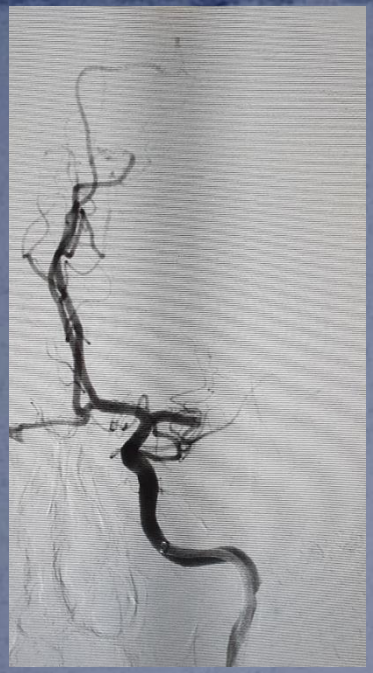
For selected pts with anterior circulation LVO admitted >6 h …< 16 h (ischemic-necrotic mismatch DAWN-DIFFUSE criteria)

MAY BE REASONABLE ***IIb (B-C) EVIDENCE***

In combination with/without IV thrombolysis for selected pts* admitted <4,5 h/6h and smaller anterior circulation vessel occlusion or posterior circulation vessel occlusion

For selected pts WITH anterior circulation LVO admitted >16 h …< 24 h (ischemic-necrotic mismatch-DAWN criteria)

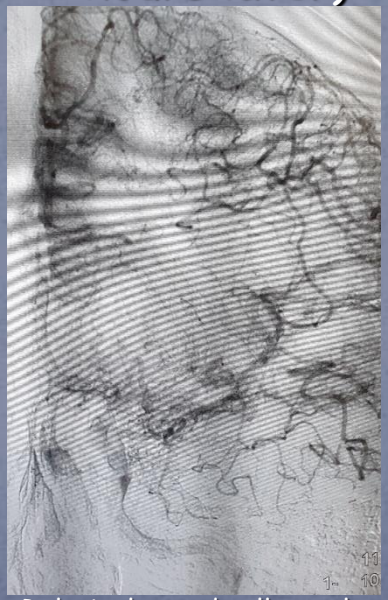
IV Thrombolysis + Thrombo-aspiration with Penumbra ACE 68 thrombectomy catheter TICI 3



R sided hemiplegia
5 h prior admission and
6 Hours prior puncture

NIHSS 23

TICI 2b (almost 2 hours later)



Relatively good collateral flow

MECHANICAL THROMBECTOMY

*Stent-retrievers OR direct thrombo-aspiration (mTICI 2b/3)

SHOULD BE PERFORMED ***I (A) EVIDENCE***

In combination with/without IV thrombolysis for pts* admitted <4,5 h/6h and anterior circulation LVO

For selected pts with anterior circulation LVO admitted >6 h …< 16 h (ischemic-necrotic mismatch DAWN-DIFFUSE criteria)

MAY BE REASONABLE ***IIb (B-C) EVIDENCE***

In combination with/without IV thrombolysis for selected pts* admitted <4,5 h/6h and

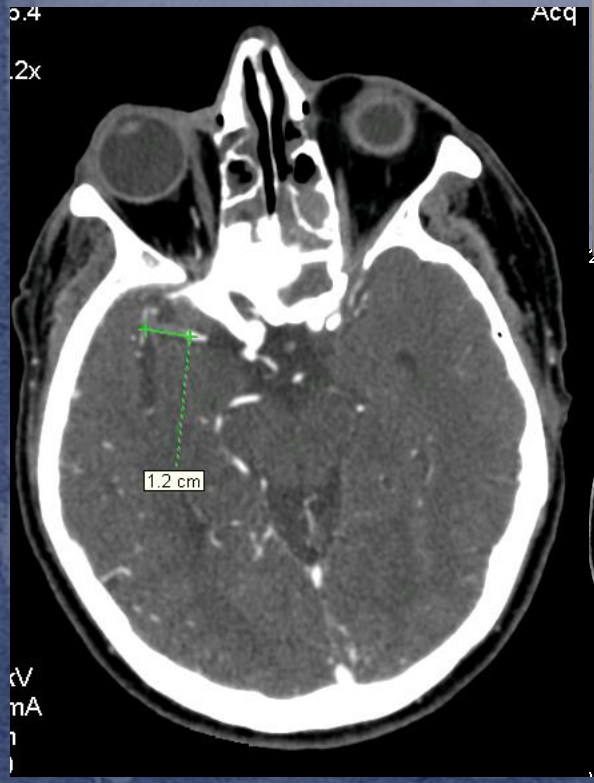
smaller anterior circulation vessel occlusion or posterior circulation vessel occlusion

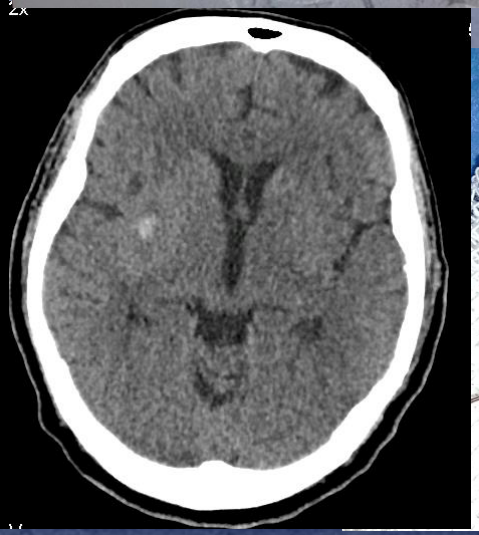
For selected pts WITH anterior circulation LVO admitted >16 h …< 24 h (ischemic-necrotic mismatch-DAWN criteria)

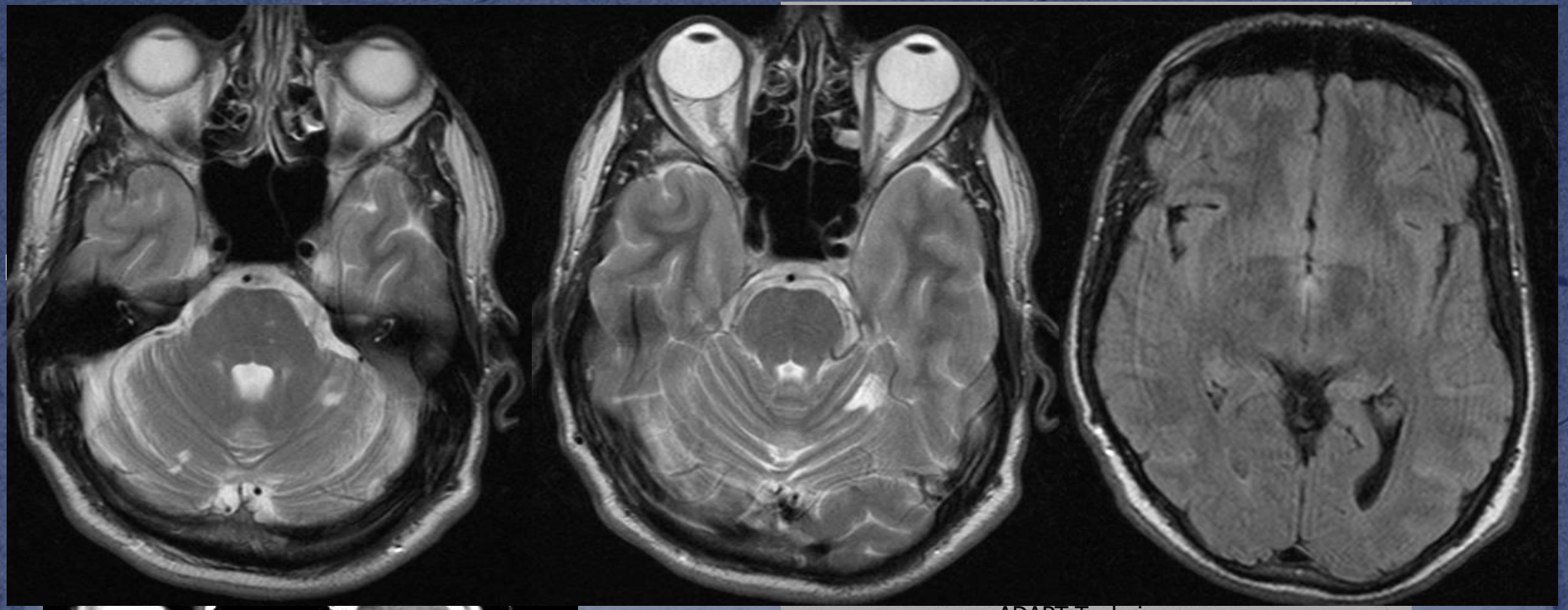
Day after NIHSS 10

1-week NIHSS 1

63 y.o male with a history of AF
L sided hemiplegia 2 h prior to admission
NIHSS 16
NECT "Hyperdense R M1-MCA"
Recent angioplasty of lower limb (day before)

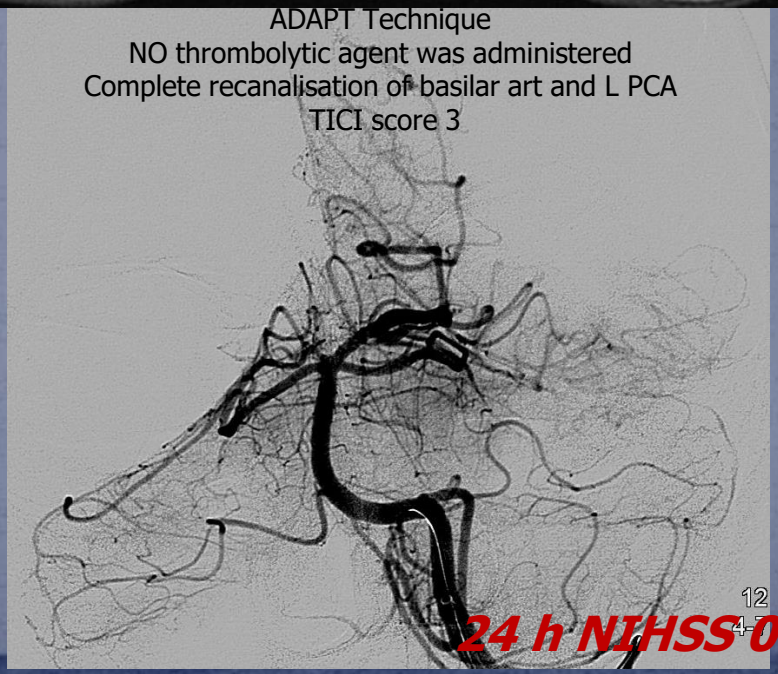






Initial plain CT scan
Hyperdense basilar artery

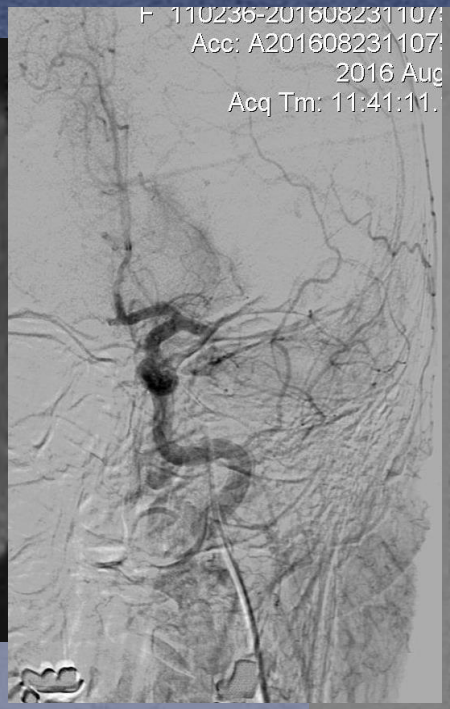
ADAPT Technique
NO thrombolytic agent was administered
Complete recanalisation of basilar art and L PCA
TICI score 3



24 h NIHSS 0

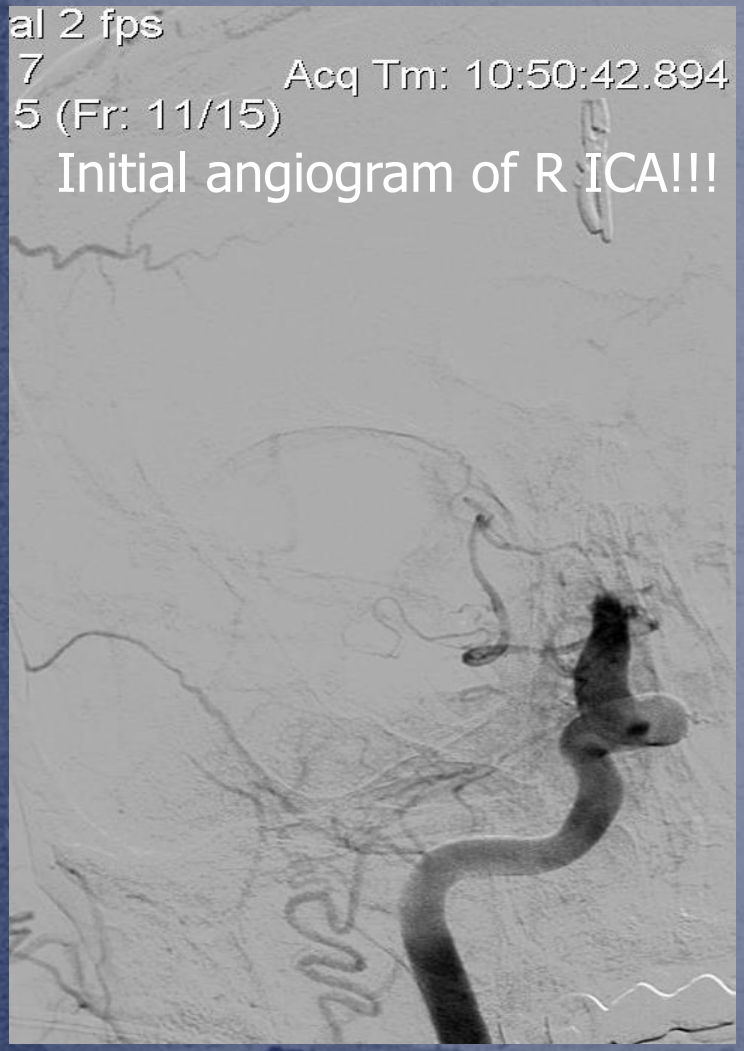
55 ετών γυναίκα με ιστορικό αμυλοείδωσης
Πρόσφατο ισχαιμικό έμφρακτο ΔΕ μέσης εγκεφαλικής αρτηρίας.

Την επόμενη μέρα εμφάνισε ΔΕ ημιπληγία
NECT "Υπέρπυκνη ΑΡ μέση και πρόσθια εγκεφαλική αρτηρία"
CTA: Επιβεβαίωση θρόμβων

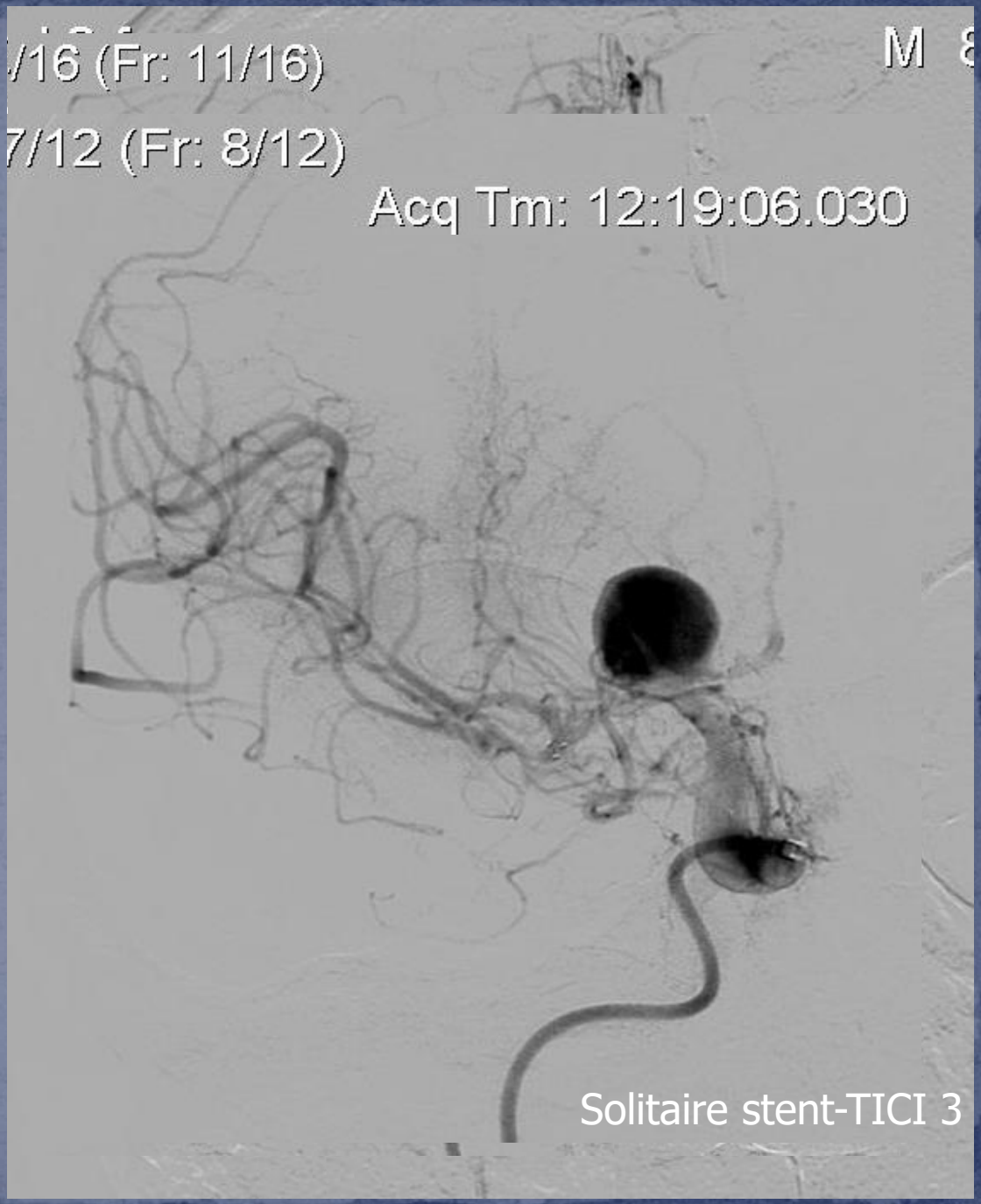


OUT OF THE BOX CASE 1

52 y old male with SAH due to R carotid tip aneurysm rupture



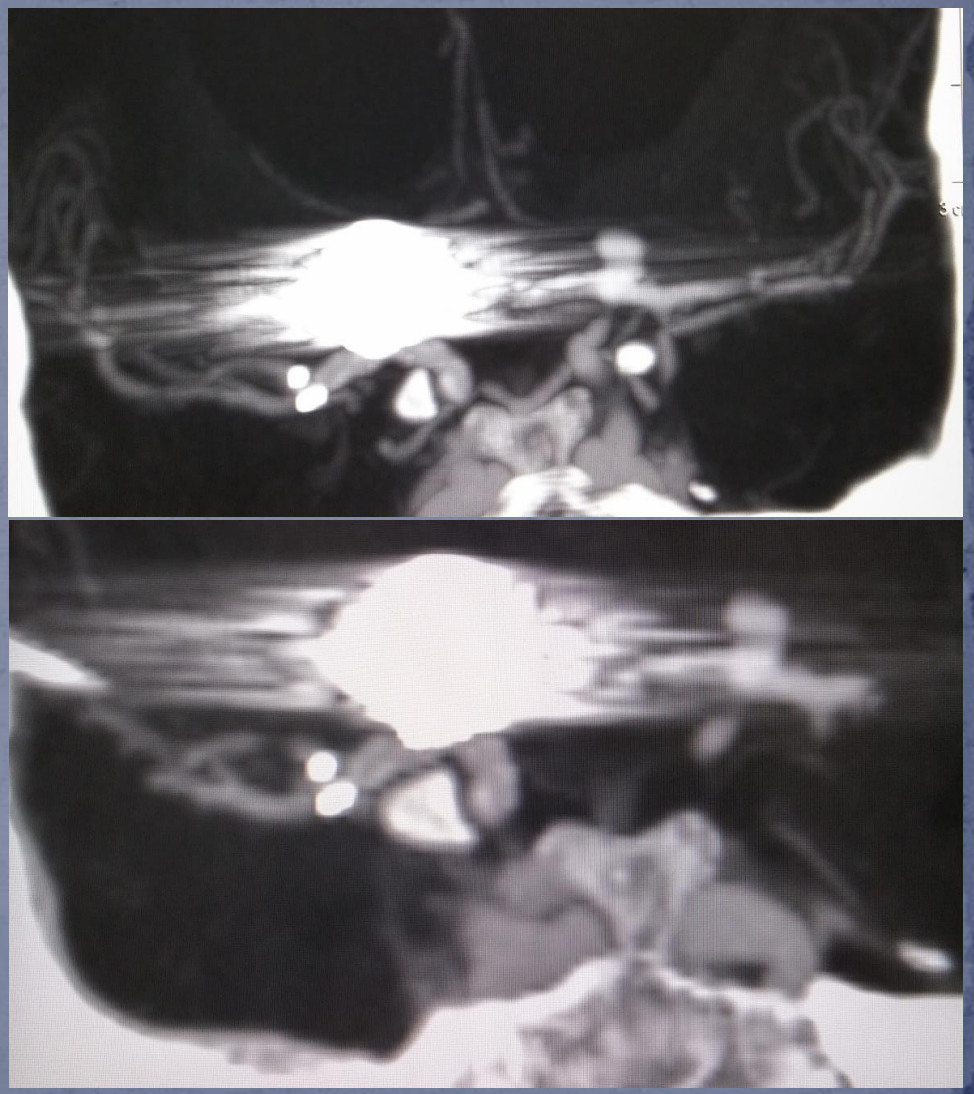
Initial angiogram of R ICA!!!



Solitaire stent-TICI 3

OUT OF THE BOX CASE

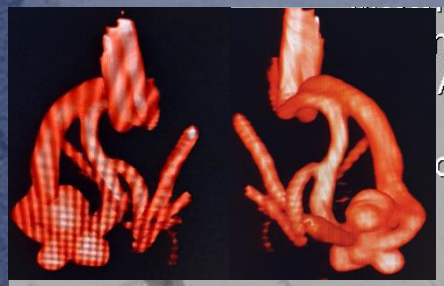
Check-up angiogram 1 week later

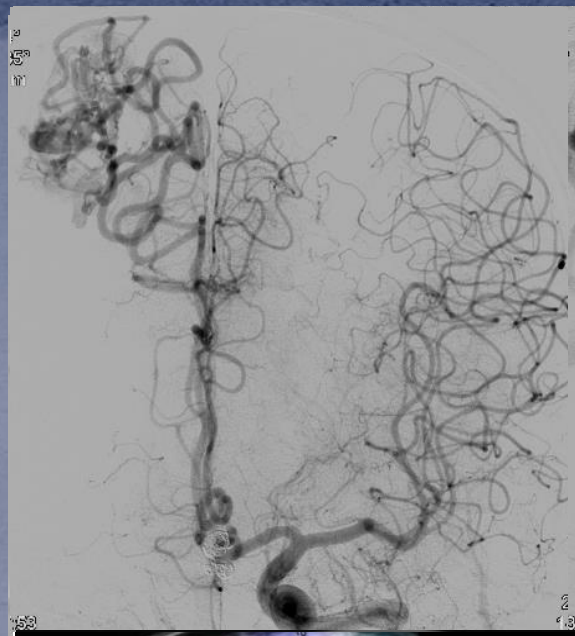


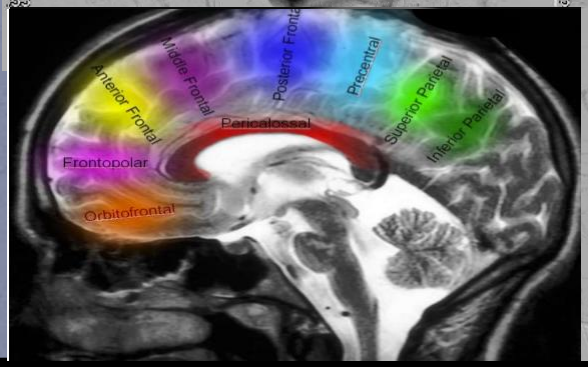
Check-up CTA 1 month later

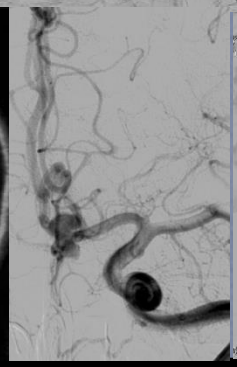
OUT OF THE BOX CASE 2

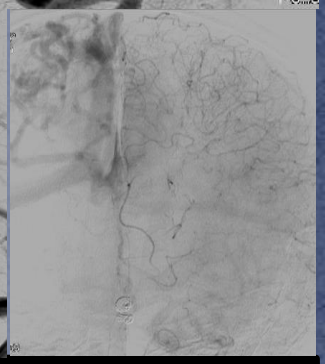
65 y old male with SAH due to complex (flow related ?) acom aneurysm rupture

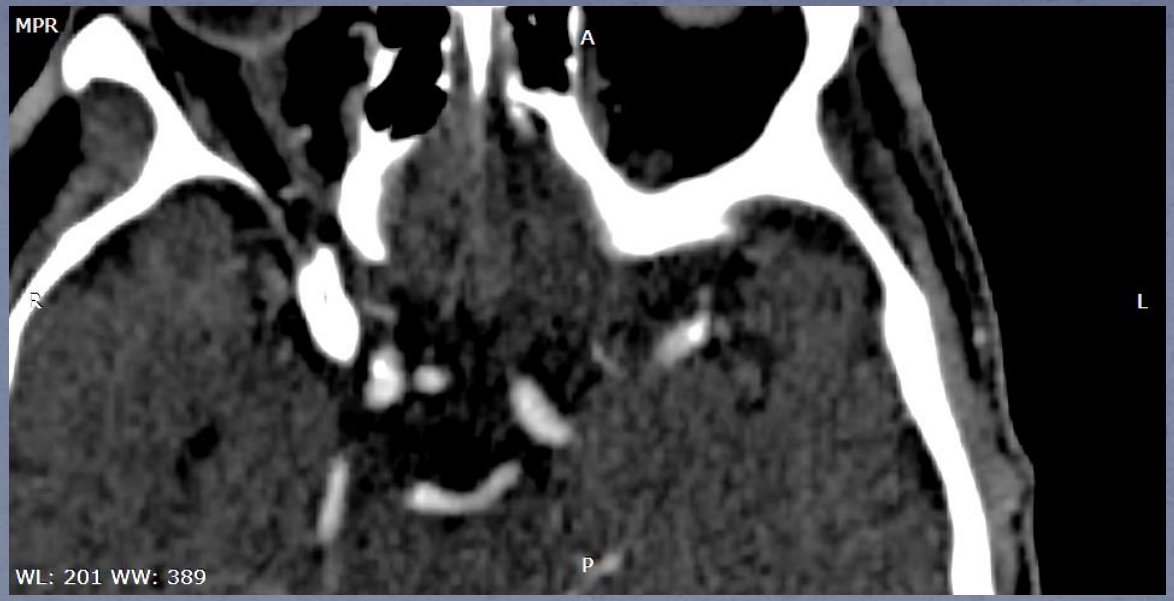


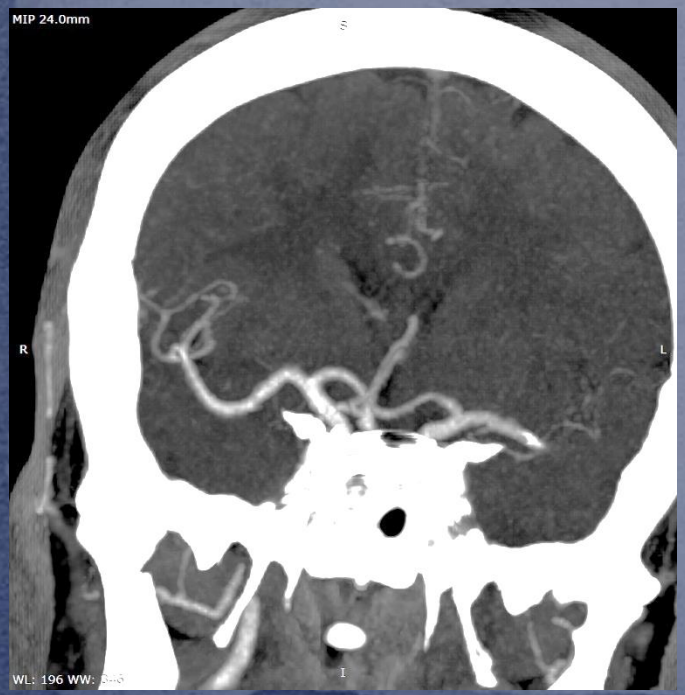




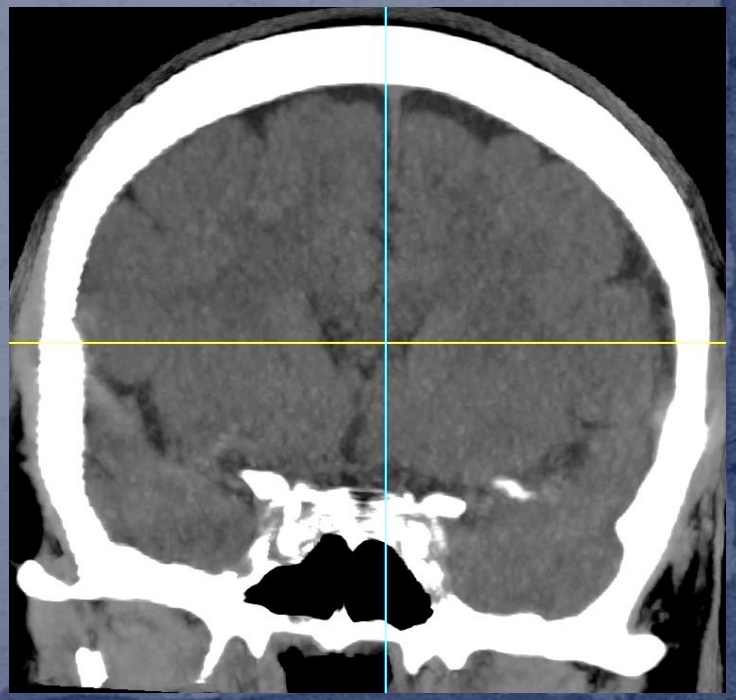








Male 67yo R sided hemiplegia, aphasia 5h prior to admission

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Head
Cerebral 2 fps
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UNIV. HOSPITAL OF PATRAS
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Head
Cerebral 2 fps


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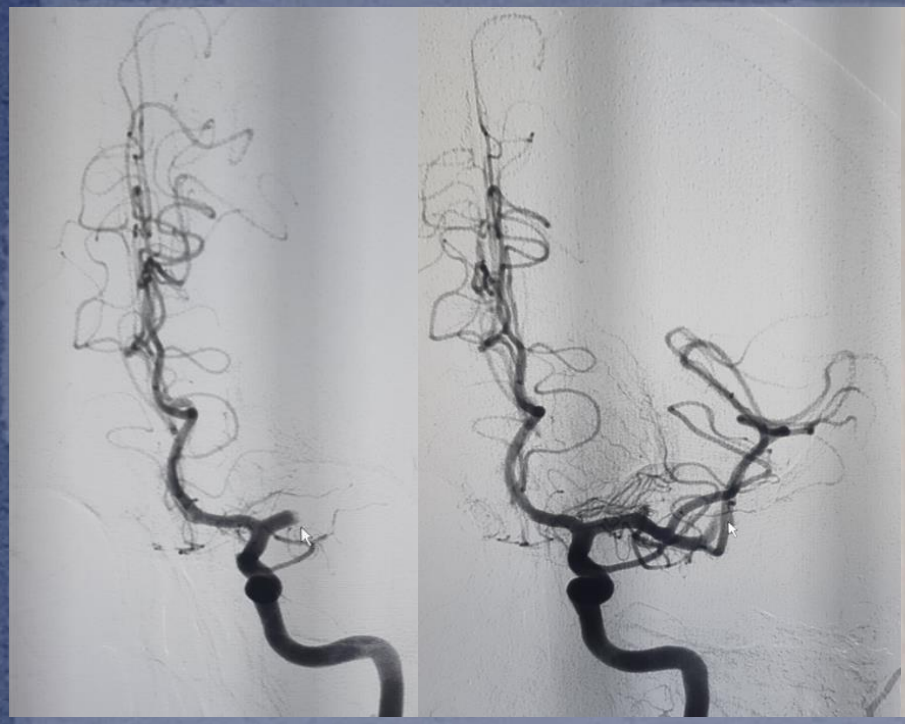

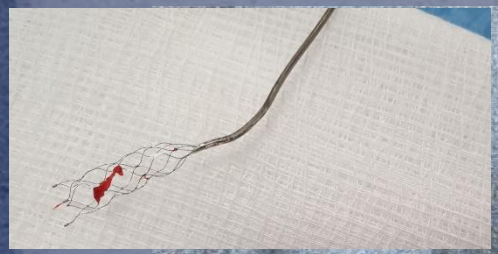


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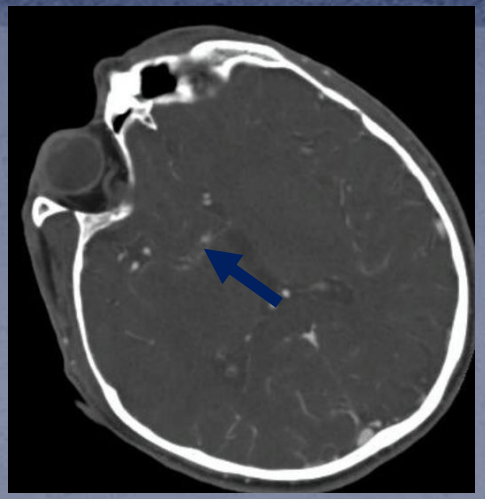
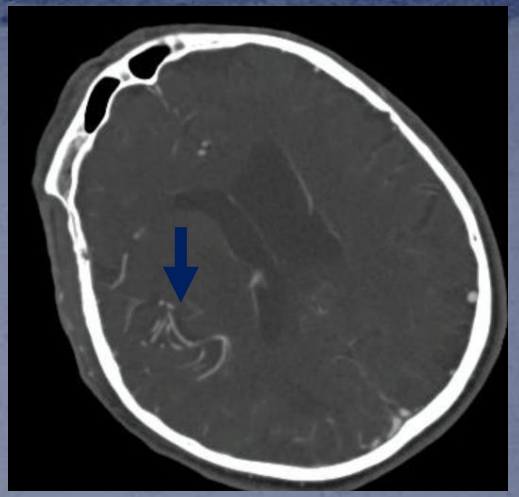
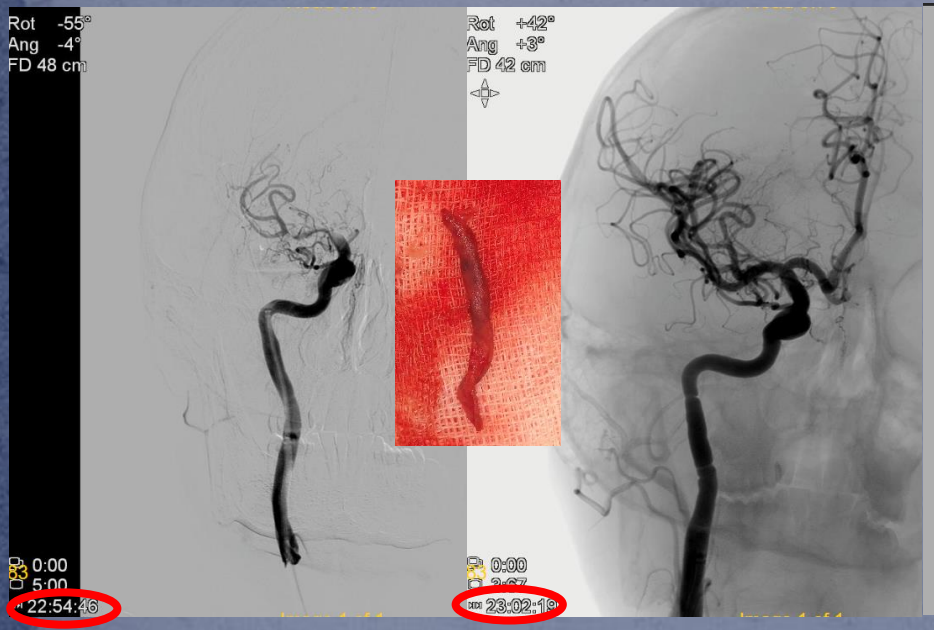
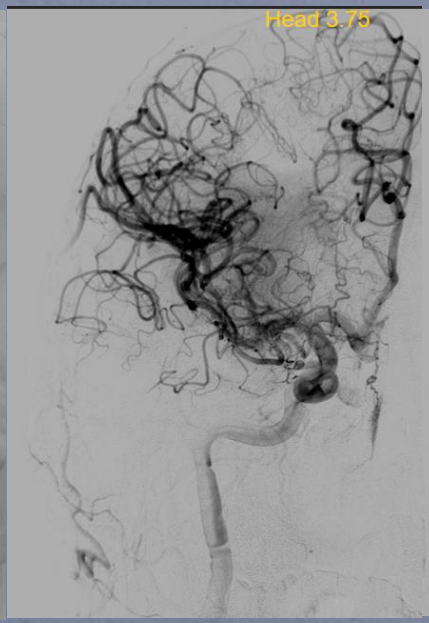
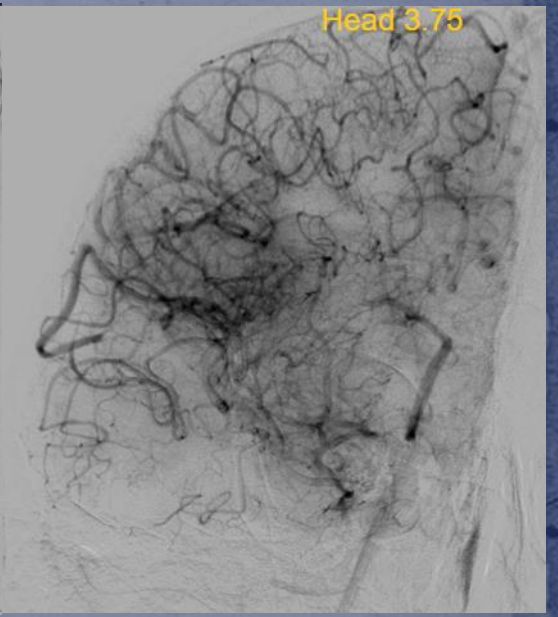




58 ετών άνδρας
ΑΡ ημιπληγία από 5ώρου
NIHSS score 18

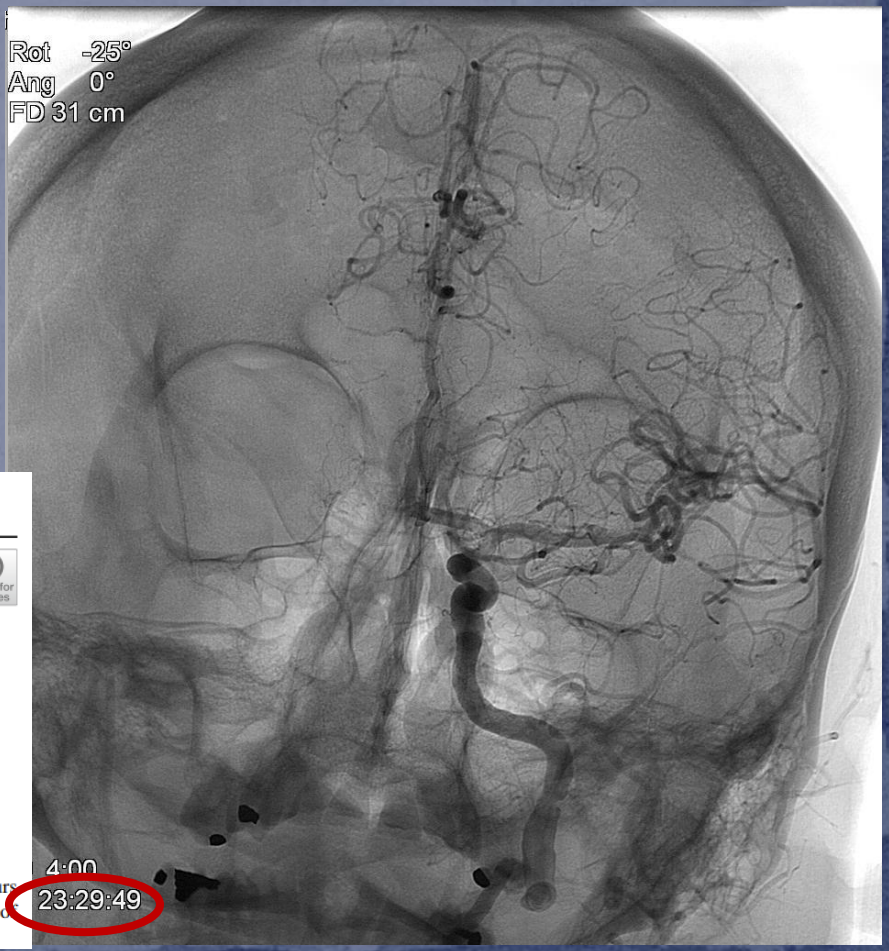






ΓΡΗΓΟΡΗ ΑΠΟΜΑΚΡΥΝΣΗ ΘΡΟΜΒΟΥ ΜΕ ΚΑΛΟ ΠΑΡΑΠΛΕΥΡΟ

59 ετών γυναίκα με ιστορικό ΚΜ
και πρόσφατης απόξεσης
ΔΕ ημιπληγία από 4ώρου
NIHSS score 20
NECT "Υπέρπυκνη ΑΡ μέση
εγκεφαλική αρτηρία"



Journal of Neurology
https://doi.org/10.1007/s00415-020-09946-6

ORIGINAL COMMUNICATION

Check for updates

Mechanical thrombectomy for ischaemic stroke in the anterior circulation: off-hours effect

Olfa Kaaouana[1,2] · Nicolas Bricout[1,3] · Barbara Casolla[1,2] · François Caparros[1,2] · Lucie Della Schiava[1,2] · François Mounier-Vehier[4] · Marco Pasi[1,2] · Nelly Dequatre-Ponchelle[1,2] · Jean-Pierre Pruvo[1,3] · Charlotte Cordonnier[1,2] · Hilde Hénon[1,2] · Didier Leys[1,2]

Received: 27 April 2020 / Revised: 20 May 2020 / Accepted: 22 May 2020

Conclusion Our study did not show worse outcomes in patients treated at off-hours. This result suggests that the off-hours effect reported in other studies can be minimized by a coordinated organisation of stroke care providing similar levels of care at off-hours.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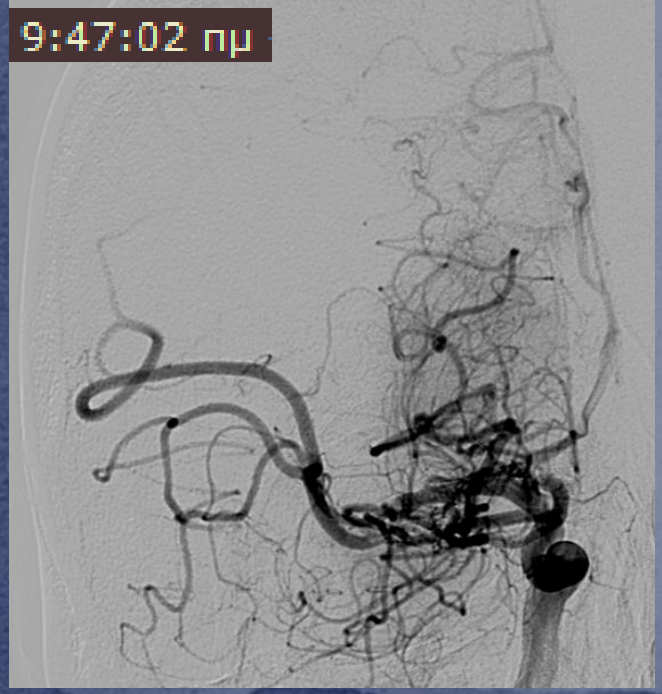
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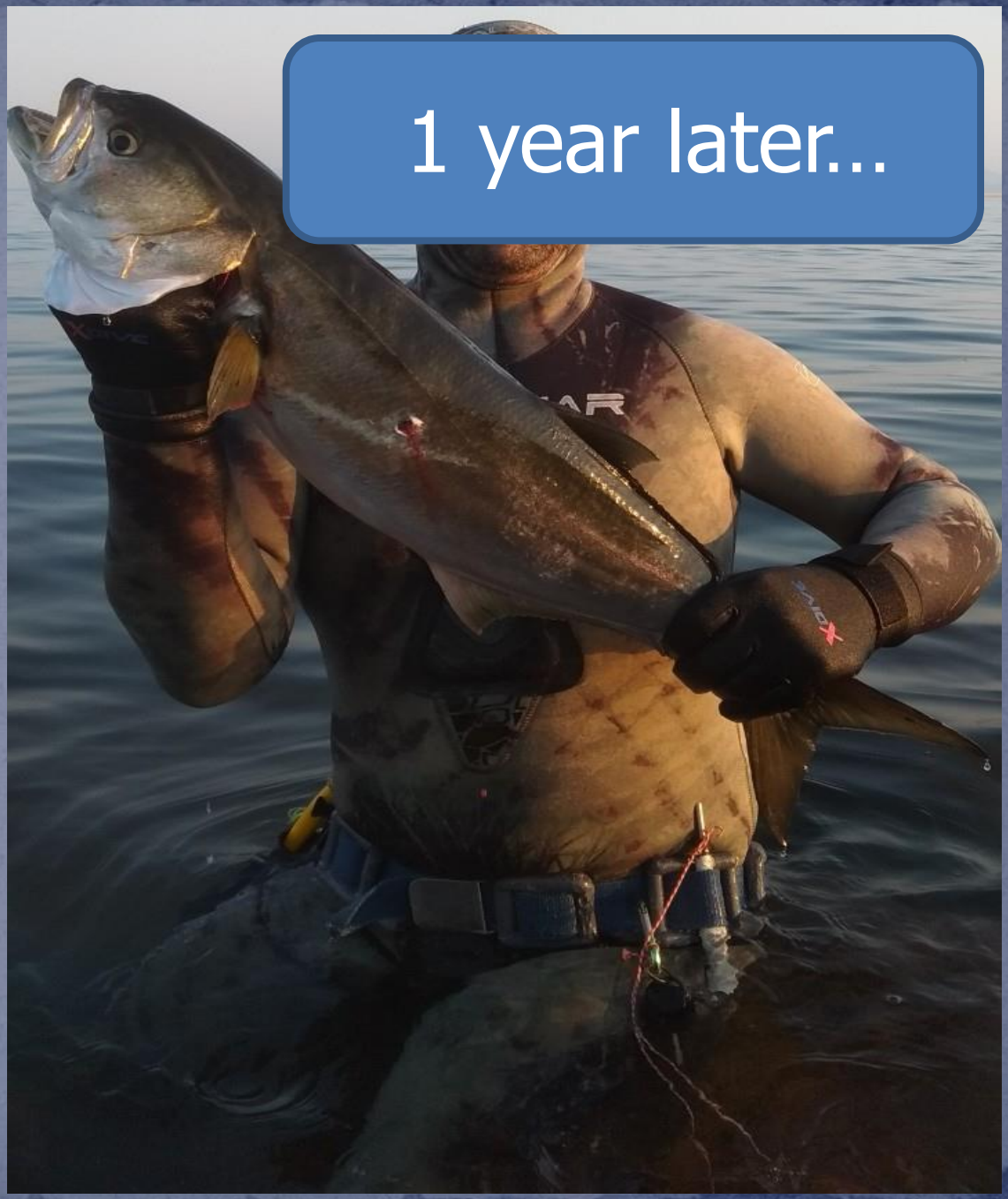

1 year later…

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Trial of Endovascular Therapy for Acute Ischemic Stroke with Large Infarct

X. Huo, G. Ma, X. Tong, X. Zhang, Y. Pan, T.N. Nguyen, G. Yuan, H. Han, W. Chen, M. Wei, Jiangang Zhang, Z. Zhou, X. Yao, G. Wang, W. Song, X. Cai, G. Nan, D. Li, A.Y.-C. Wang, W. Ling, C. Cai, C. Wen, E. Wang, L. Zhang, C. Jiang, Y. Liu, G. Liao, X. Chen, T. Li, S. Liu, J. Li, F. Gao, N. Ma, D. Mo, L. Song, X. Sun, X. Li, Y. Deng, G. Luo, M. Lv, H. He, A. Liu, Jingbo Zhang, S. Mu, Lian Liu, J. Jing, X. Nie, Z. Ding, W. Du, X. Zhao, P. Yang, Liping Liu, Yilong Wang, D.S. Liebeskind, V.M. Pereira, Z. Ren, Yongjun Wang, and Z. Miao, for the ANGEL-ASPECT Investigators*

This article was published on February 10, 2023, at NEJM.org.

Endovascular treatment versus no endovascular treatment after 6–24 h in patients with ischaemic stroke and collateral flow on CT angiography (MR CLEAN-LATE) in the Netherlands: a multicentre, open-label, blinded-endpoint, randomised, controlled, phase 3 trial

Susanne G H Olthuis, F Anne V Pirson, Florentina M E Pinckaers, Wouter H Hinsenveld, Daan Nieboer, Angelique Ceulemans, Robrecht R M M Knapen, M M Quirien Robbe, Olvert A Berkhemer, Marianne A A van Walderveen, Geert J Lycklama à Nijeholt, Maarten Uyttenboogaart, Wouter J Schonewille, P Matthijs van der Sluijs, Lennard Wolff, Henk van Voorst, Alida A Postma, Stefan D Roosendaal, Anouk van der Hoorn, Bart J Emmer, Menno G M Krietemeijer, Pieter-Jan van Doormaal, Bob Roozenbeek, Robert-Jan B Goldhoorn, Julie Staals, Inger R de Ridder, Christiaan van der Leij, Jonathan M Coutinho, H Bart van der Worp, Rob T H Lo, Reinoud P H Bokkers, Ewoud I van Dijk, Hieronymus D Boogaarts, Marieke J H Wermer, Adriaan C G M van Es, Julia H van Tuijl, Hans G J Kortman, Rob A R Gons, Lonneke S F Yo, Jan-Albert Vos, Karlijn F de Laat, Lukas C van Dijk, Ido R van den Wijngaard, Jeannette Hofmeijer, Jasper M Martens, Paul J A M Brouwers, Tomas Bulut, Michel J M Remmers, Thijs E A M de Jong, Heleen M den Hertog, Boudewijn A A M van Hasselt, Anouk D Rozeman, Otto E H Elgersma, Bas van der Veen, Davy R Sudiono, Hester F Lingsma, Yvo B W E M Roos, Charles B L M Majoie, Aad van der Lugt, Diederik W J Dippel, Wim H van Zwam, Robert J van Oostenbrugge*, on behalf of the MR CLEAN-LATE investigators†*

www.thelancet.com Published online March 29, 2023 https://doi.org/10.1016/S0140-6736(23)00575-5

Stroke

CLINICAL TRIAL

Endovascular Versus Medical Management of Posterior Cerebral Artery Occlusion Stroke: The PLATO Study

Thanh N. Nguyen, MD; Muhammad M. Qureshi, MBBS, MPH; Davide Strambo, MD; Daniel Strbian, MD, PhD, MSc; Silja Räty, MD, PhD; Christian Herweh, MD; Mohamad Abdalkader, MD; Marta Olive-Gadea, MD; Marc Ribo, MD, PhD; Marios Psychogios, MD; Urs Fischer, MD, MS; Anh Nguyen, MD; Joji B. Kuramatsu, MD; David Haupenthal, MD; Martin Köhrmann, MD; Cornelius Deuschl, MD; Jordi Kühne Escola, MD; Shadi Yaghi, MD; Liqi Shu, MD; Volker Puetz, MD; Daniel P.O. Kaiser, MD; Johannes Kaesmacher, MD, PhD; Adnan Mujanovic, MD; Dominique Cornelius Marterstock, MD; Tobias Engelhorn, MD; Piers Klein, MA; Diogo C. Haussen, MD; Mahmoud H. Mohammaden, MD; Hend Abdelhamid, MD; Lorena Souza Viana, MD; Bruno Cunha, MD; Isabel Fragata, MD, MSc, PhD; Michele Romoli, MD, PhD; Francesco Diana, MD; Pekka Virtanen, MD; Kimmo Lappalainen, MD; Judith Clark, RN; Stavros Matsoukas, MD; Johanna T. Fifi, MD; Sunil A. Sheth, MD; Sergio Salazar-Marioni, MD; João Pedro Marto, MD; João Nuno Ramos, MD; Milena Miszczuk, MD; Christoph Riegler, MD; Ashutosh P. Jadhav, MD, PhD; Shashvat M. Desai, MD; Volker Maus, MD; Maximilian Kaeder, MD; Adnan H. Siddiqui, MD, PhD; Andre Monteiro, MD; Hesham E. Masoud, MD; Neil Suryadevara, MD; Maxim Mokin, MD, PhD; Shail Thanki, MD; James E. Siegler, MD; Jane Khalife, MD; Italo Linfante, MD; Guilherme Dabus, MD; Negar Asdaghi, MD; Vasu Saini, MD; Christian H. Nolte, MD; Eberhard Siebert, MD; Thomas R. Meinel, MD, PhD; Stefanos Finitsis, MD; Markus A. Möhlenbruch, MD; Peter A. Ringleb, MD; Anne Berberich, MD; Raul G. Nogueira, MD; Uta Hanning, MD; Lukas Meyer, MD; Patrik Michel, MD; Simon Nagel, MD

Yoshimura S, Sakai N, Yamagami H, et al. Endovascular therapy for acute stroke with a large ischemic region. N Engl J Med 2022; **386:** 1303–13.

Sarraj A, Hassan AE, Abraham MG, et al. Trial of endovascular thrombectomy for large ischemic strokes. N Engl J Med 2023; published online Feb 23. https://doi.org/10.1056/NEJMoa2214403.

Huo X, Ma G, Tong X, et al. Trial of endovascular therapy for acute ischemic stroke with large infarct. N Engl J Med 2023; published online Feb 10. https://doi.org/10.1056/NEJMoa2213379.

Nguyen TN, Qureshi MM, Strambo D, et al. Endovascular Versus Medical Management of Posterior Cerebral Artery Occlusion Stroke: The PLATO Study. Stroke. 2023 Jul;54(7):1708-1717. doi:

Systematic review

Endovascular treatment for large-core ischaemic stroke: a meta-analysis of randomised controlled clinical trials

Lina Palaiodimou,[1] Amrou Sarraj,[2] Apostolos Safouris,[1,3,4] Georgios Magoufis,[5,6] Robin Lemmens,[7,8] Else Charlotte Sandset,[9,10] Guillaume Turc,[11,12,13,14] Marios Psychogios,[15] Georgios Tsivgoulis[1,16]

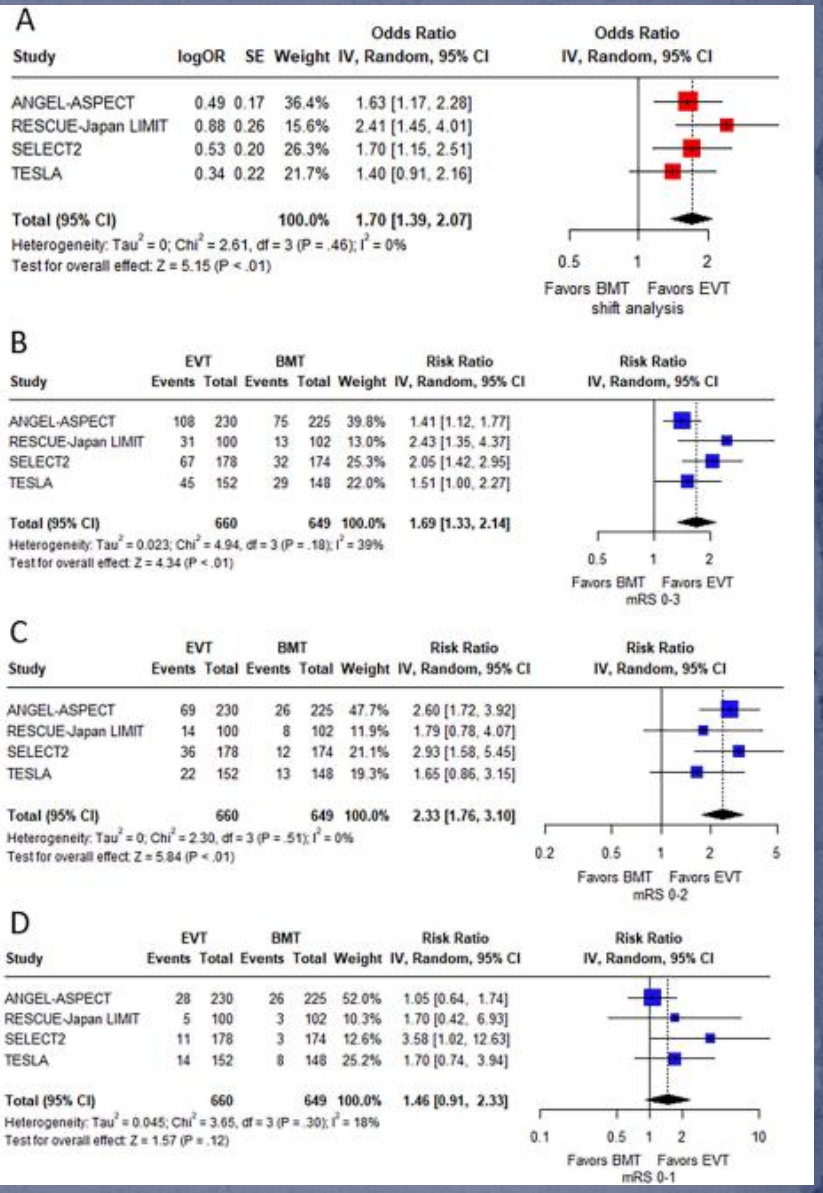
BMJ

Palaiodimou L, *et al*. *J Neurol Neurosurg Psychiatry* 2023;**94**:781–785. doi:10.1136/jnnp-2023-331513

Table 1 Characteristics of studies included in the systematic review and meta-analysis

Study	Recruiting centres	Period of enrolment	Inclusion criteria: Years of age	NIHSS score	Prestroke mRS score	Stroke onset	Large core	Imaging used to evaluate ASPECTS	Included patients (N)	EVT	BMT
ANGEL-ASPECT[4]	China	October 2020–May 2022	18–80	6–30	0–1	Within 24 hours	ASPECTS 3–5 OR an ischaemic-core volume of 70 to 100 ml.	Non-contrast CT	456	231	225
RESCUE-Japan LIMIT[6]	Japan	November 2018–September 2021	>18, no upper age limit	≥6, no upper limit	0–1	Within 6 hours or within 24 hours and no FLAIR early changes	ASPECTS 3–5	Non-contrast CT or diffusion-weighted MRI	203	101	102
SELECT2[5]	International	September 2019–September 2022	18–85	≥6, no upper limit	0–1	Within 24 hours	ASPECTS 3–5 or an ischaemic-core volume of at least 50 mL (no upper limit for volume of ischaemic core)	Non-contrast CT	352	178	174
TESLA[6,7]	USA	July 2019–October 2022	18–85	≥6, no upper limit	0–1	Within 24 hours	ASPECTS 2–5	Non-contrast CT	300	152	148

ANGEL-ASPECT, Endovascular Therapy in Acute Anterior Circulation Large Vessel Occlusive Patients With a Large Infarct Core; ASPECTS, Alberta Stroke Program Early CT Score; BMT, Best Medical Treatment; EVT, Endovascular Treatment; mRS, Modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; RESCUE Japan-LIMIT, Recovery by Endovascular Salvage for Cerebral Ultra-acute Embolism Japan Large Ischemic core Trial; SELECT2, Randomised Controlled Trial to Optimize Patient Selection for Endovascular Treatment in Acute Ischemic Stroke; TESLA, Thrombectomy for Emergent Salvage of Large Anterior Circulation Ischemic Stroke.



Randomized Controlled Trial > Lancet. 2023 Nov 11;402(10414):1753-1763.
doi: 10.1016/S0140-6736(23)02032-9. Epub 2023 Oct 11.

Endovascular thrombectomy for acute ischaemic stroke with established large infarct: multicentre, open-label, randomised trial

Martin Bendszus [1], Jens Fiehler [2], Fabien Subtil [3], Susanne Bonekamp [1], Anne Hege Aamodt [4], Blanca Fuentes [5], Elke R Gizewski [6], Michael D Hill [7], Antonin Krajina [8], Laurent Pierot [9], Claus Z Simonsen [10], Kamil Zeleňák [11], Rolf A Blauenfeldt [10], Bastian Cheng [12], Angélique Denis [3], Hannes Deutschmann [13], Franziska Dorn [14], Fabian Flottmann [15], Susanne Gellißen [15], Johannes C Gerber [16], Mayank Goyal [7], Jozef Haring [17], Christian Herweh [1], Silke Hopf-Jensen [18], Vi Tuan Hua [19], Märit Jensen [12], Andreas Kastrup [20], Christiane Fee Keil [21], Andrej Klepanec [22], Egon Kurča [23], Ronni Mikkelsen [24], Markus Möhlenbruch [1], Stefan Müller-Hülsbeck [18], Nico Münnich [25], Paolo Pagano [9], Panagiotis Papanagiotou [26], Gabor C Petzold [27], Mirko Pham [28], Volker Puetz [29], Jan Raupach [8], Gernot Reimann [25], Peter Arthur Ringleb [30], Maximilian Schell [12], Eckhard Schlemm [12], Silvia Schönenberger [30], Bjørn Tennøe [31], Christian Ulfert [1], Kateřina Vališ [32], Eva Vítková [33], Dominik F Vollherbst [1], Wolfgang Wick [30], Götz Thomalla [34]; TENSION Investigators

Abstract

Background: Recent evidence suggests a beneficial effect of endovascular thrombectomy in acute ischaemic stroke with large infarct; however, previous trials have relied on multimodal brain imaging, whereas non-contrast CT is mostly used in clinical practice.

Methods: In a prospective multicentre, open-label, randomised trial, patients with acute ischaemic stroke due to large vessel occlusion in the anterior circulation and a large established infarct indicated by an Alberta Stroke Program Early Computed Tomographic Score (ASPECTS) of 3-5 were randomly assigned using a central, web-based system (using a 1:1 ratio) to receive either endovascular thrombectomy with medical treatment or medical treatment (ie, standard of care) alone up to 12 h from stroke onset. The study was conducted in 40 hospitals in Europe and one site in Canada. The primary outcome was functional outcome across the entire range of the modified Rankin Scale at 90 days, assessed by investigators masked to treatment assignment. The primary analysis was done in the intention-to-treat population. Safety endpoints included mortality and rates of symptomatic intracranial haemorrhage and were analysed in the safety population, which included all patients based on the treatment they received. This trial is registered with ClinicalTrials.gov, NCT03094715.

Findings: From July 17, 2018, to Feb 21, 2023, 253 patients were randomly assigned, with 125 patients assigned to endovascular thrombectomy and 128 to medical treatment alone. The trial was stopped early for efficacy after the first pre-planned interim analysis. At 90 days, endovascular thrombectomy was associated with a shift in the distribution of scores on the modified Rankin Scale towards better outcome (adjusted common OR 2·58 [95% CI 1·60-4·15]; p=0·0001) and with lower mortality (hazard ratio 0·67 [95% CI 0·46-0·98]; p=0·038). Symptomatic intracranial haemorrhage occurred in seven (6%) patients with thrombectomy and in six (5%) with medical treatment alone.

Interpretation: Endovascular thrombectomy was associated with improved functional outcome and lower mortality in patients with acute ischaemic stroke from large vessel occlusion with established large infarct in a setting using non-contrast CT as the predominant imaging modality for patient selection.

ORIGINAL ARTICLE

Trial of Endovascular Thrombectomy for Large Ischemic Strokes

Amrou Sarraj, M.D., Ameer E. Hassan, D.O., Michael G. Abraham, M.D., Santiago Ortega-Gutierrez, M.D., Scott E. Kasner, M.D., M. Shazam Hussain, M.D., Michael Chen, M.D., Spiros Blackburn, M.D., Clark W. Sitton, M.D., Leonid Churilov, Ph.D., Sophia Sundararajan, M.D., Yin C. Hu, M.D., et al., for the SELECT2 Investigators*

April 6, 2023
N Engl J Med 2023; 388:1259-1271

The NEW ENGLAND JOURNAL of MEDICINE

RESEARCH SUMMARY

Trial of Endovascular Thrombectomy for Large Ischemic Strokes

Sarraj A et al. DOI: 10.1056/NEJMoa2214403

CLINICAL PROBLEM

Endovascular thrombectomy has been shown to be more beneficial than medical therapy alone in selected patients with ischemic stroke due to occlusion of a large cerebral vessel. However, patients with large strokes, who have a poor prognosis, have been underrepresented in thrombectomy trials.

CLINICAL TRIAL

Design: A phase 3, international, randomized, open-label trial evaluated endovascular thrombectomy plus medical care, as compared with standard medical care alone, in patients with acute ischemic stroke due to occlusion of the internal carotid artery or the first segment of the middle cerebral artery (or both), with a large ischemic-core volume on noncontrast computed tomography (CT), CT perfusion imaging, or diffusion-weighted magnetic resonance imaging.

Intervention: 352 patients were assigned to undergo endovascular thrombectomy within 24 hours after stroke onset in addition to standard medical care or to receive standard medical care alone. The primary outcome was the ordinal score on the modified Rankin scale at 90 days (range, 0 to 6, with higher scores indicating greater disability). Functional independence was a secondary outcome. Safety outcomes included symptomatic intracranial hemorrhage and death from any cause.

RESULTS

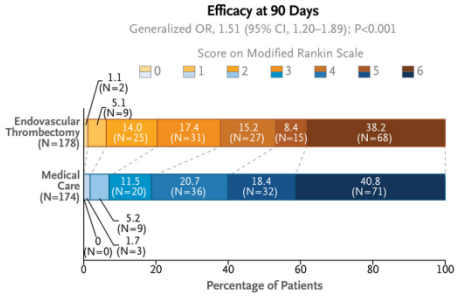
Efficacy: Endovascular thrombectomy outperformed medical care with respect to the modified Rankin scale score at 90 days.

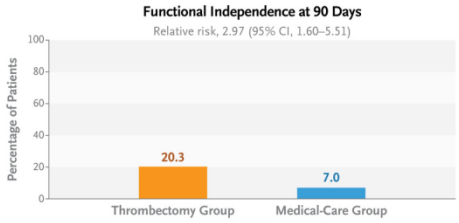
Safety: Procedural complications occurred in 18.5% of the patients in the thrombectomy group. Mortality and the incidence of intracranial hemorrhage were similar in the two groups.

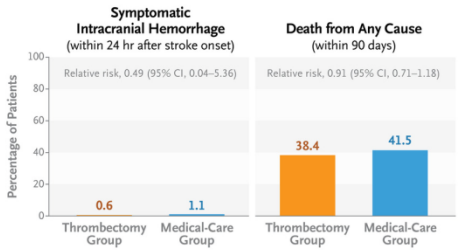
LIMITATIONS

- The trial was terminated early for efficacy, potentially leading to overestimation of the effects of thrombectomy.
- Only about 20% of the patients received intravenous thrombolytic agents before randomization.

Links: Full Article | NEJM Quick Take | Editorial







CONCLUSIONS

In patients with acute ischemic stroke due to a proximal large-vessel occlusion and with a large ischemic-core volume, endovascular thrombectomy in addition to standard medical care resulted in better functional outcomes at 90 days than medical care alone but was associated with procedural vascular complications.

Stroke

CLINICAL AND POPULATION SCIENCES

Cost-Effectiveness of Mechanical Thrombectomy for Treatment of Nonminor Ischemic Stroke Across Europe

Paolo Candio, PhD; Mara Violato, PhD; Jose Leal, DPhil; Ramon Luengo-Fernandez, DPhil

February 2021 *Stroke.* 2021;52:664–673.

BACKGROUND AND PURPOSE: Mechanical thrombectomy (MT) has been recommended for the treatment of nonminor ischemic stroke by national and international guidelines, but cost-effectiveness evidence has been generated for only a few countries using heterogeneous evaluation methods. We estimate the cost-effectiveness of MT across 32 European countries.

METHODS: A Markov model was developed to estimate the cost-effectiveness of MT compared with standard care over a 5-year time horizon. Patients with ischemic stroke eligible for MT were identified from 2017 country-specific incidence data. A societal perspective was adopted, including health, social, and informal care costs, and productivity losses. Model outcomes were expressed as quality-adjusted life years. Sensitivity analyses were conducted to test the robustness of findings.

RESULTS: We identified 267 514 ischemic stroke cases that were eligible for MT treatment across 32 European countries. MT was found to be more effective and cheaper than standard care in two-thirds of the countries (21/32) and cost-effective in all but one country (Bulgaria). Across Europe, the intervention was estimated to produce over 101 327 additional quality-adjusted life years (95% uncertainty interval, 65 180–149 085) and cost savings of $981 million (€868 million, 95% uncertainty interval, −1544 to 2564) and of $1.7 billion (€1.5 billion, 95% uncertainty interval, −1.2 to 3.6) in health and social care and societal costs, respectively.

CONCLUSIONS: MT is highly likely to be cost-effective compared with standard care across Europe as a whole and in the vast majority of European countries.

Original research article

EUROPEAN STROKE JOURNAL

Access to and delivery of acute ischaemic stroke treatments: A survey of national scientific societies and stroke experts in 44 European countries

European Stroke Journal
0(0) 1–16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DOI: 10.1177/2396987318786023
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SAGE

Diana Aguiar de Sousa*[1], Rascha von Martial*[2], Sònia Abilleira[3], Thomas Gattringer[4], Adam Kobayashi[5], Miquel Gallofré[6], Franz Fazekas[4], Istvan Szikora[7], Valery Feigin[8], Valeria Caso[9] and Urs Fischer[2]; on behalf of the ESO ESMINT EAN SAFE Survey on Stroke Care collaborators†

Date received: 17 March 2018; accepted: 24 May 2018

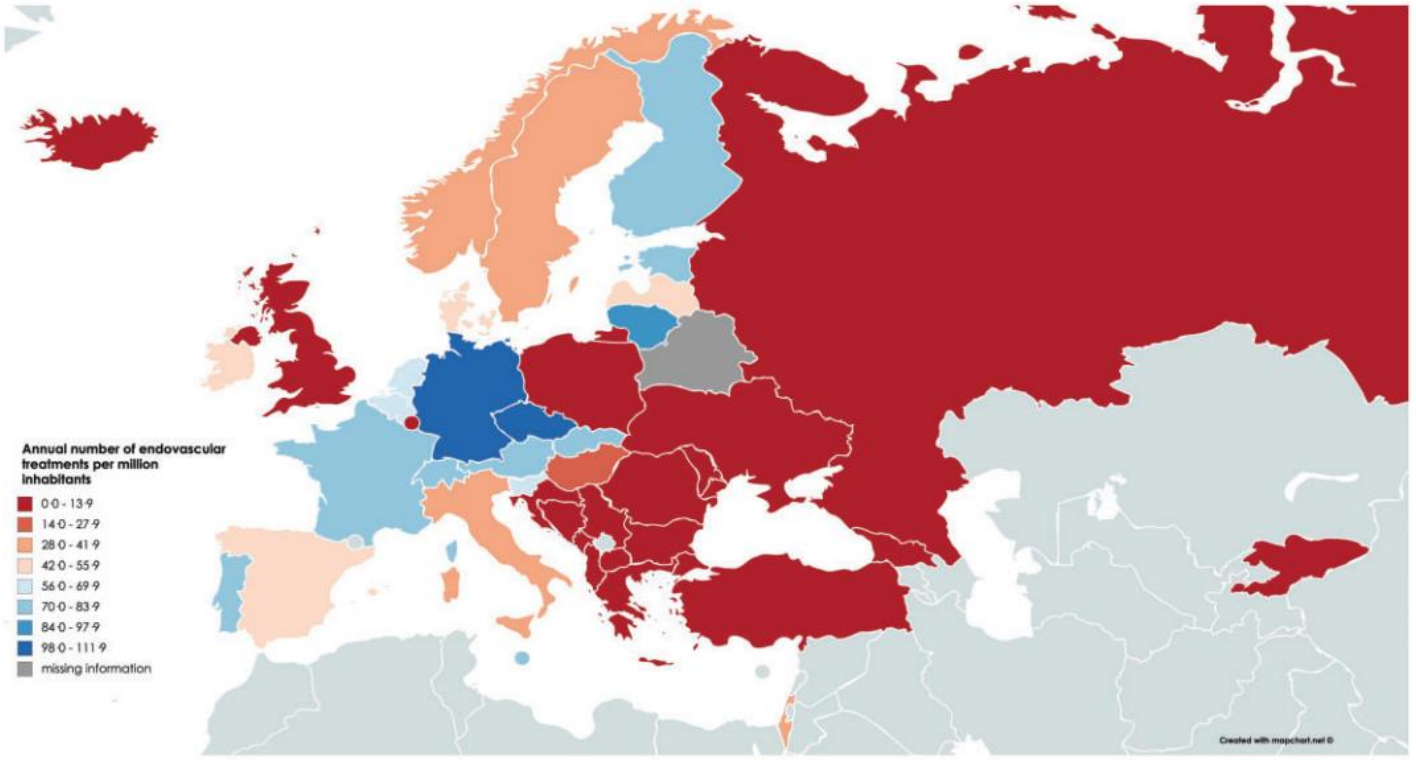

Figure 5. Choropleth map showing contemporary annual rates of endovascular treatments (EVT) for ischaemic stroke per million population in 43 European countries (mean 37.1, 95% CI 26.7–47.5).

Moving from traditional to more advanced treatments in stroke care is cost-effective: A case study from Greece

Konstantinos Dimitriadis, MD,[a,b] Ilias Kyriopoulos,[c] Georgios Tsivgoulis, MD,[d] Konstantinos Vemmos, MD,[e] Wolfgang G. Kunz, MD,[f] and Elias Mossialos, MD[c]

Journal of Stroke and Cerebrovascular Diseases, Vol. 31, No. 11 (November), 2022: 106764

The annual incidence of ischemic strokes (IS) in Greece was estimated to be between 22,182 and 46,860.

In countries with more advanced health systems around 5% of patients with LVO receive EVT

In Greece only 0.2% of all stroke patients are treated with EVT and 1% with IVT

Best practice stroke treatment was cost-effective and affordable in a case study based on Greece

According to our findings, best practice was shown to increase lifetime effectiveness by 0.22 QALYs per patient.

The calculated additional annual cost for improving stroke outcomes only comprised 0.07% of the total health budget.

Return of investment (ROI) analysis for implantation of EVT in Alberta, Canada demonstrated a ROI in less than a year

In Greece ~ 30000 stroke pts/y	According to International standards 1500 MT (5%) BUT we perform 70 MT/y (0,2%)
In our district (6η ΥΠΕ) we should expect ~ 3600 pts/y	According to International standards 180 MT (5%) BUT we perform 7 MT/y (0,21%)

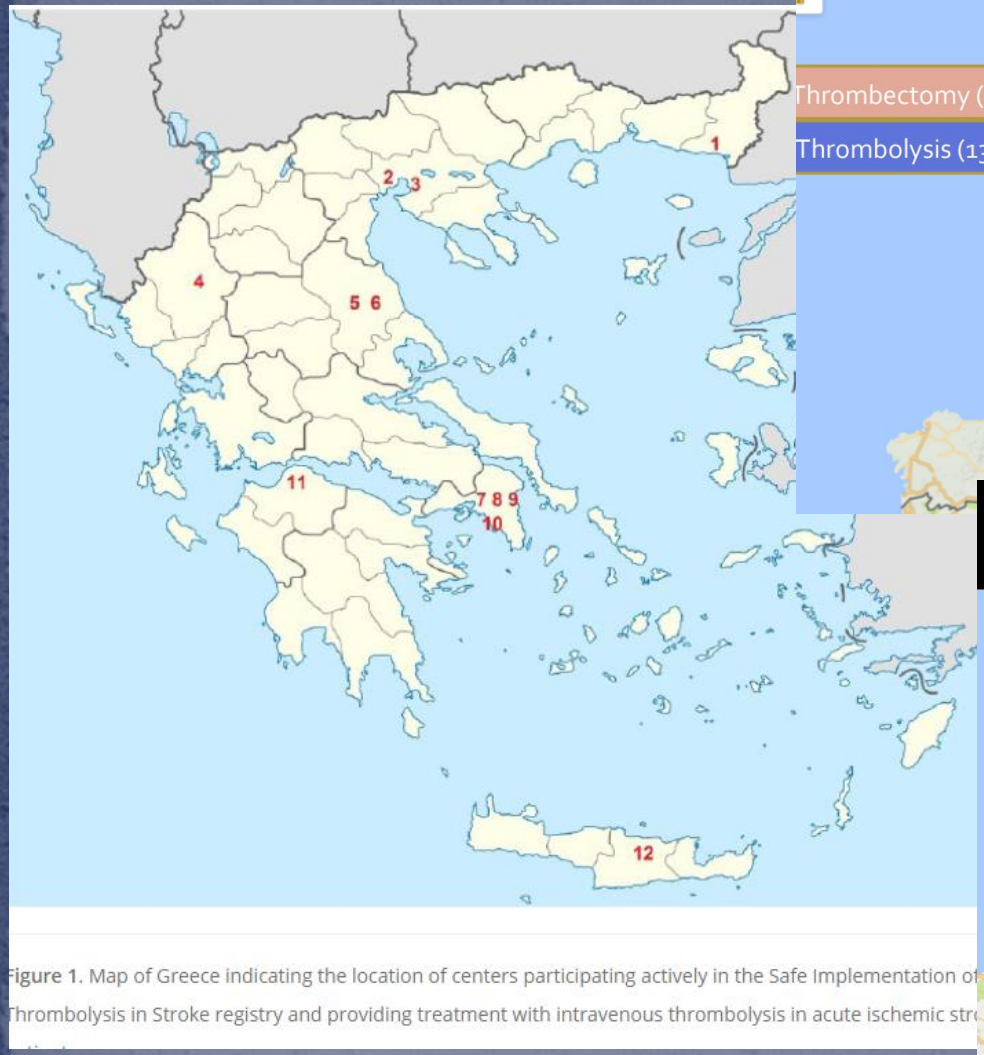

Figure 1. Map of Greece indicating the location of centers participating actively in the Safe Implementation of Thrombolysis in Stroke registry and providing treatment with intravenous thrombolysis in acute ischemic stro

German Stroke Units (279)

SITS registry – last 5y

	SITS Global	SITS Greece
Centers	1930	36
Patients	357068	2717 ΠΑΤΡΑ: 102 IVT (4%)
N of MT	42606	**314** ΠΑΤΡΑ: 35 MT (11%)
Mean age	70	64
Median NIHSS	16	17
Cardioembolism	43%	40%
sICH*	2.2%	1.4%
mRS 0-2 in 3mo	44%	50%
Mortality in 3mo	11%	14%

Prof Tsivgoulis, personal communication

- 1.2 million people in total
- BUT…
  - Patras population 200.000
  - Ionian islands
  - Remote areas
  - Poor road conditions
  - Lack of co-ordination

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SECURE AUTOMATION. SINGLE PLATFORM. HIPAA COMPLIANT.

Clinically Proven, Data-driven Technology Developed by Experts

With products to fit hospitals of all sizes, the clinically validated Rapid platform uses artificial intelligence to create high quality, advanced views of the brain from non-contrast CT, CT angiography, CT perfusion, and MRI diffusion and perfusion scans.

- Rapid ICH
- Rapid Hyperdensity
- Rapid ASPECTS
- Rapid CTA
- Rapid LVO
- Rapid CTP
- Rapid MRI
- RapidAI Insights
- Rapid Workflow for Stroke: Web
- **Rapid Workflow for Stroke: Mobile**

RAPIDAI

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Centralized View

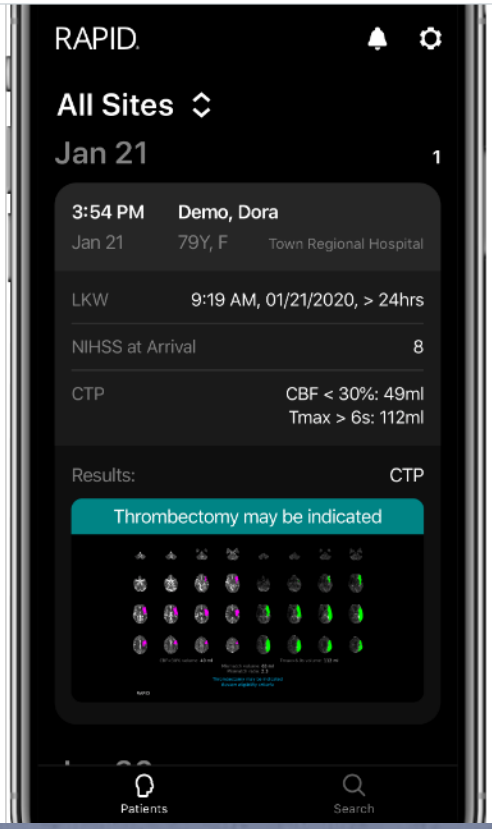
Convenient, centralized list of patient events, messages, and results.

In-app Calling

In-app calling for quicker communications with stroke team members

Notifications

Real-time notifications of new case events and messages.



Go Notification

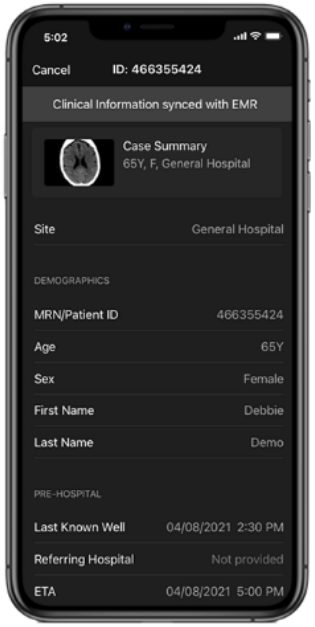
Quicker notification and coordination of stroke teams for critical cases.

EMR Integration

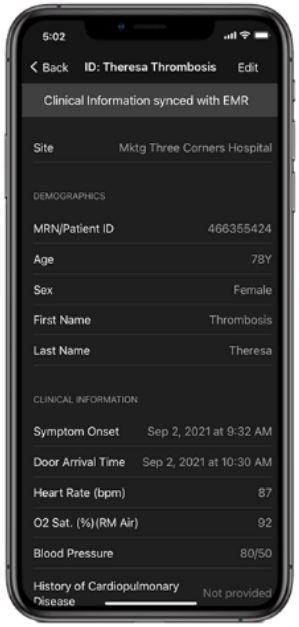
EMR Integration can enable automatic retrieval of the most current patient clinical data

Case Summary

Summary of a patient's journey from prehospital routing, ER triage, imaging diagnostics, communication and workflow



For Stroke



For PE

RapidAI EMR Integration with Rapid Workflow

Maintain data integrity

Teams have confidence they have access to the single source of truth for patient data to help drive faster treatment decisions and ease documentation.

Increase team efficiency and save time

With RapidAI EMR Integration, care teams have the data they need at their fingertips, enabling them to spend more time on patient care and less time on data entry.

Streamline Reporting

RapidAI EMR Integration can enable more robust reporting capabilities by sharing reliable and consistent patient treatment and outcomes data. With this integration, hospital administrators can more easily generate and share important reporting to assess and optimize processes for better patient care and outcomes.


INCREASE IN THE NUMBER OF PATIENTS. 24/7
Cooperation with agencies (Institutions Region, Ministry)
Bi-plane Angio suite (24/7)
Public awareness (information-seminars-outreach)
Add nurses
Quick transfer of information
Add Radiographers
Interconnection with other Hospitals in the Region
Add Registrars-interventional Radiologists
EKAB organization – patient transport system

TAKE HOME MESSAGES

- Η ενδαγγειακή αντιμετώπιση των ασθενών με ισχαιμικό ΑΕΕ μεγάλου αγγείου πρόσθιας κυκλοφορίας, είναι θεμελιώδους σημασίας
- Η ενδαγγειακή θεραπεία πρέπει να εφαρμόζεται το συντομότερο δυνατό
- Η θεραπευτική τεχνική πρέπει να εξατομικεύεται και εξαρτάται και από την εμπειρία του επεμβατικού
- Εξίσου αποτελεσματική είναι η θρομβοαναρρόφηση ή η χρησιμοποίηση stent (Ή ΚΑΙ ΣΥΝΔΥΑΣΜΟΣ)
- Ο συνδυασμός IVT + MT είναι ωφέλιμος
- Το τελικό θεραπευτικό αποτέλεσμα εξαρτάται από πολλούς παράγοντες

- ΒΟΥΛΗΣΗ – ΣΥΝΤΟΝΙΣΜΟΣ – ΔΙΑΘΕΣΙΜΟ ΕΞΕΙΔΙΚΕΥΜΕΝΟ ΠΡΟΣΩΠΙΚΟ