

Endovascular Treatment of Acute Ischemic Stroke : Past Present and Future

Vishal B. Jani MD

Consultant Interventional Neurology CHI Health
System Stroke Medical Director
CHI health Hospitals Nebraska

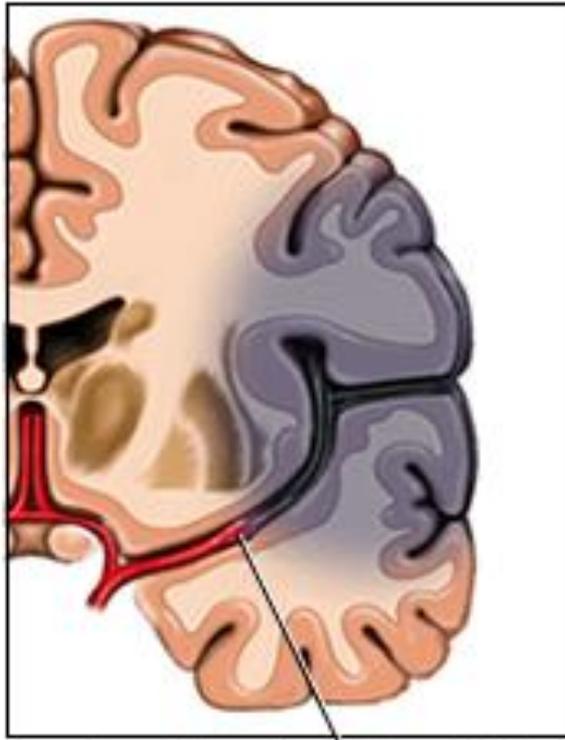
Assistant Professor,
Creighton University School of Medicine, Omaha, NE

Disclosure

Natural History of Disease

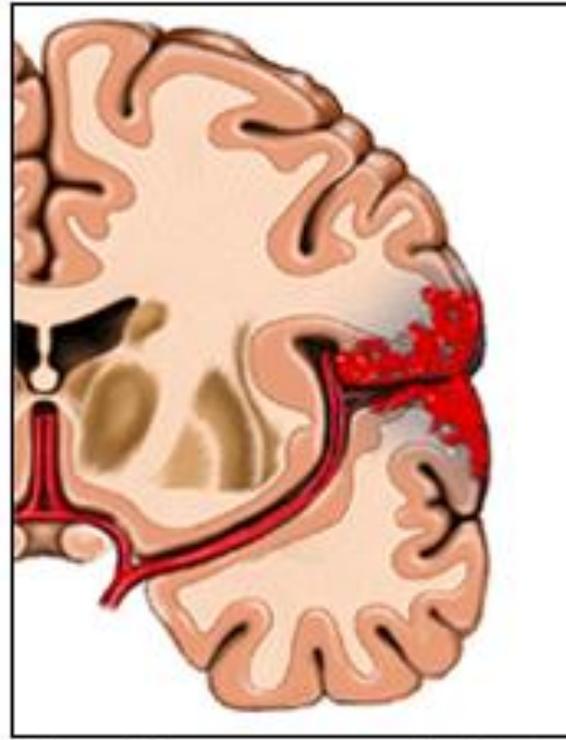
- 5th cause of morbidity and mortality
- 1 stroke every 40 seconds
- \$ 41 billion burden
- Large artery occlusion
mortality 60 to 90 %

Ischemic stroke

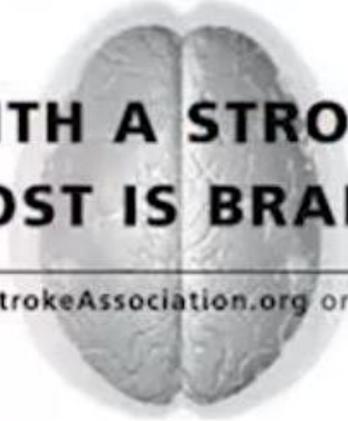


A clot blocks blood flow to an area of the brain

Hemorrhagic stroke

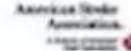


Bleeding occurs inside or around brain tissue



**WITH A STROKE,
TIME LOST IS BRAIN LOST.**

Learn more at StrokeAssociation.org or 1-888-4-STROKE.



- Each Minute

1.9 million neurons loss

Stroke Treatment before 1990s



1983 to 1996

Intravenous Thrombolysis

- Urokinase.
- Streptokinase.
- **Tissue plasminogen activator.**

The New England
Journal of Medicine

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Articles

Volume 333

DECEMBER 14, 1995

TISSUE PLASMINOGEN ACTIVATOR FOR ACUTE ISCHEMIC

Randomised double-blind placebo-controlled trial of thrombolysis therapy with intravenous alteplase in acute ischaemic stroke (ECASS II)

Werner Hacke, Markku Kaste, Cesare Fieschi, Rüdiger von Kummer, Antoni Davalos, Dieter Meier, Vincent

NDC 00242-080-27

**ALTEPLASE
ACTIVASE®**

for intravenous use

100 mg (58 million IU)

a tissue plasminogen activator



Genentech

NDC 00242-044-12

**ALTEPLASE
ACTIVASE®**

for intravenous use

50 mg (29 million IU)

a tissue plasminogen activator



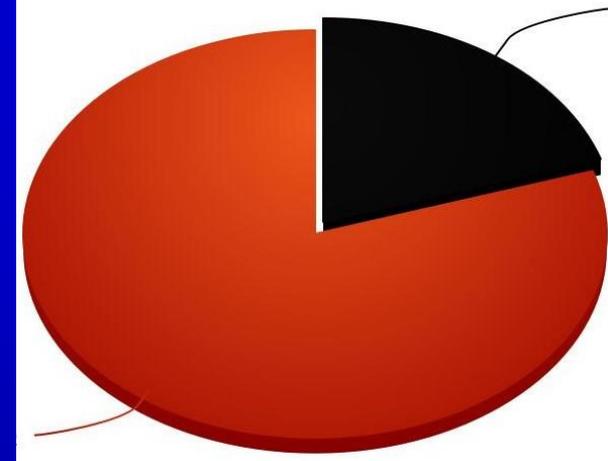
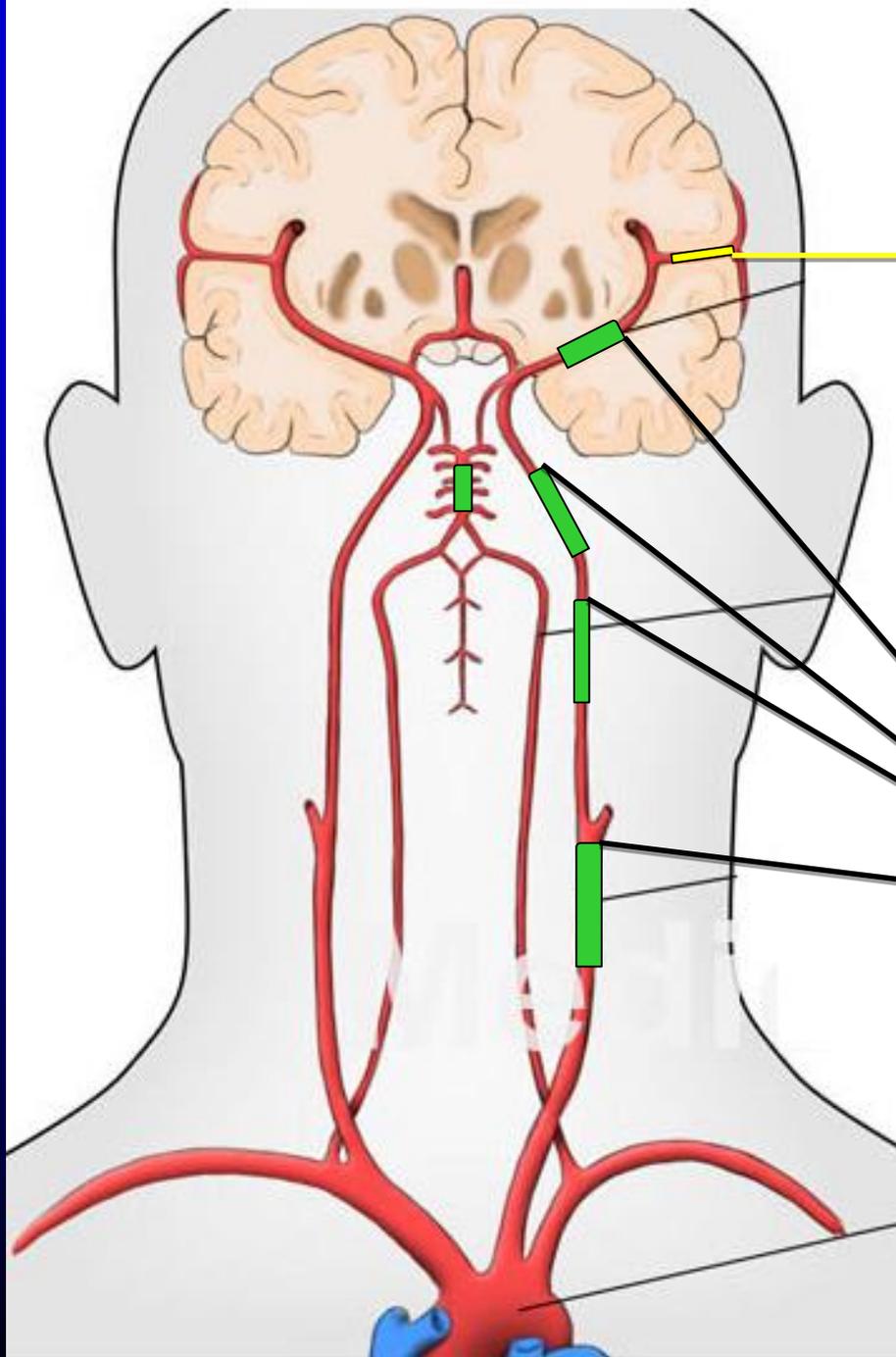
Genentech

Genentech

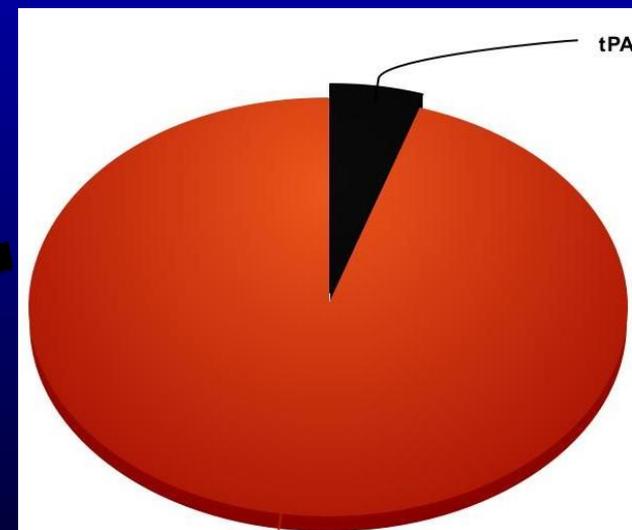
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Safety / Success

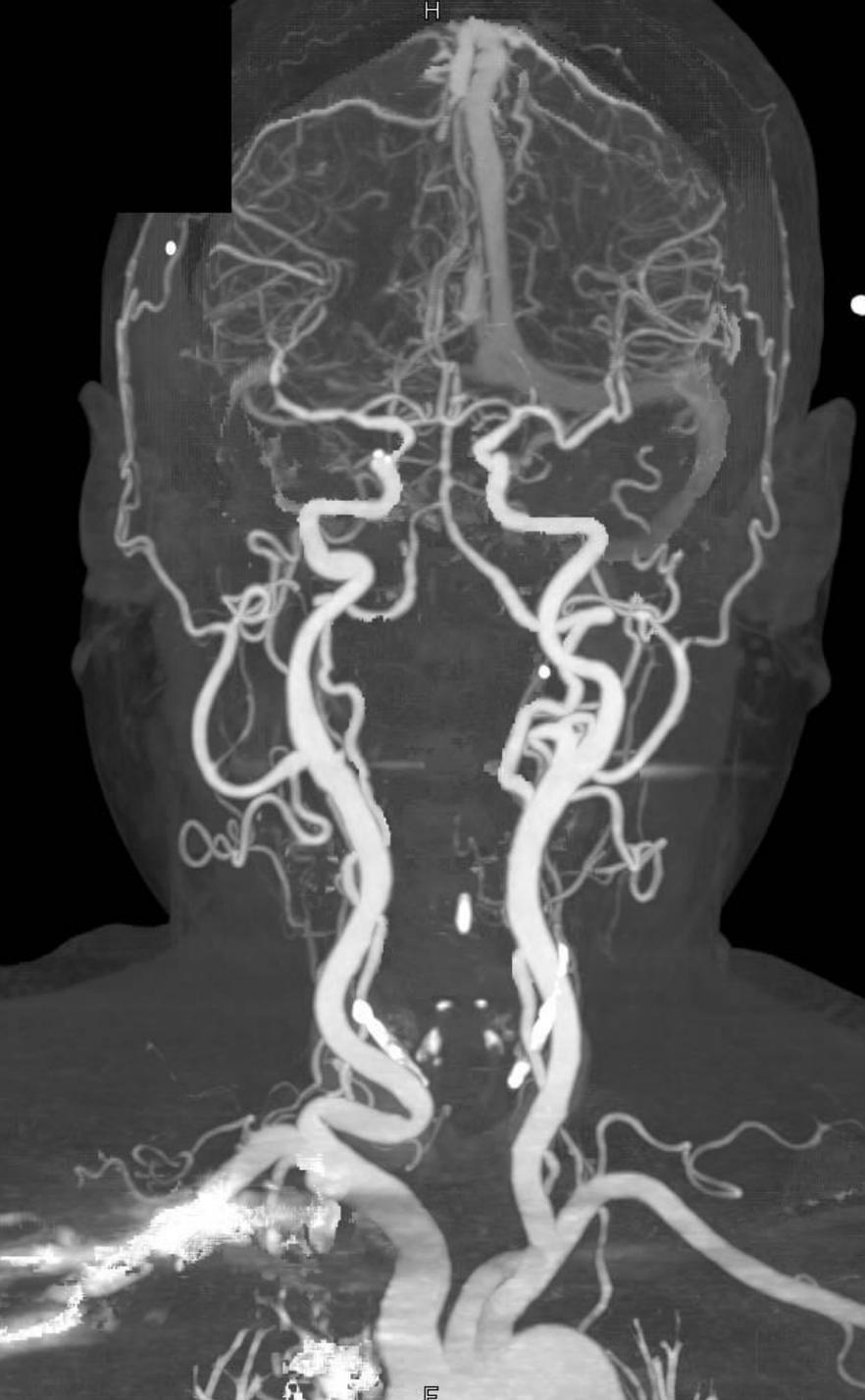
- 6% : Bleed
- 30% : Success - small clot
- 3% : Success - large clot



20%



3%



- Intra arterial Tissue plasminogen activator

Devices

Thrombectomy



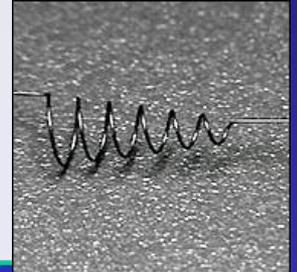
**Angioplasty
balloon**



**Penumbra
aspiration**

**Thrombectomy
+ Retriever**

**Coil based
Merci**



YEAR 1996 to YEAR 2015

IMS III		MR-RESCUE		SYNTHESIS EXPANSION	
Eligible patients who had received IV rt-PA within 3 hours after symptom onset		Patients with large-vessel, anterior-circulation occlusion within 8 hours after symptom onset		Patients within 4.5 hours after symptom onset	
Endovasc Rx	IV rt-PA only	Endovasc Rx	Standard Rx	Endovasc Rx	IV rt-PA only

A report from the Working Group of International Congress of Interventional Neurology. J Vasc Interv Neurol. 2014 May;7(1):56-75.

Summary of trials: clinical outcome at 3 months

	IMS III		MR-RESCUE		SYNTHESIS EXPANSION	
	Endovasc Rx	IV rt-PA only	Endovasc Rx	Standard Rx	Endovasc Rx	IV rt-PA only
mRS 0-2	43%	40%	38%	61%	42%	46%

A report from the Working Group of International Congress of Interventional Neurology. J Vasc Interv Neurol. 2014 May;7(1):56-75.

1996 to 2013

*Endovascular treatment
remains UNPROVEN*

2015

Multicenter Randomized Clinical Trial of Endovascular Treatment for Acute Ischemic Stroke in the Netherlands (MR CLEAN)

Endovascular Treatment for Small Core and Anterior Circulation Proximal Occlusion with Emphasis on Minimizing CT to Recanalization Times (ESCAPE)

The NEW ENGLAND
JOURNAL of MEDICINE

ESTABLISHED IN 1812 JANUARY 1, 2015 VOL. 372 NO. 1

A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

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

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Randomized Assessment of Rapid Endovascular Treatment of Ischemic Stroke

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

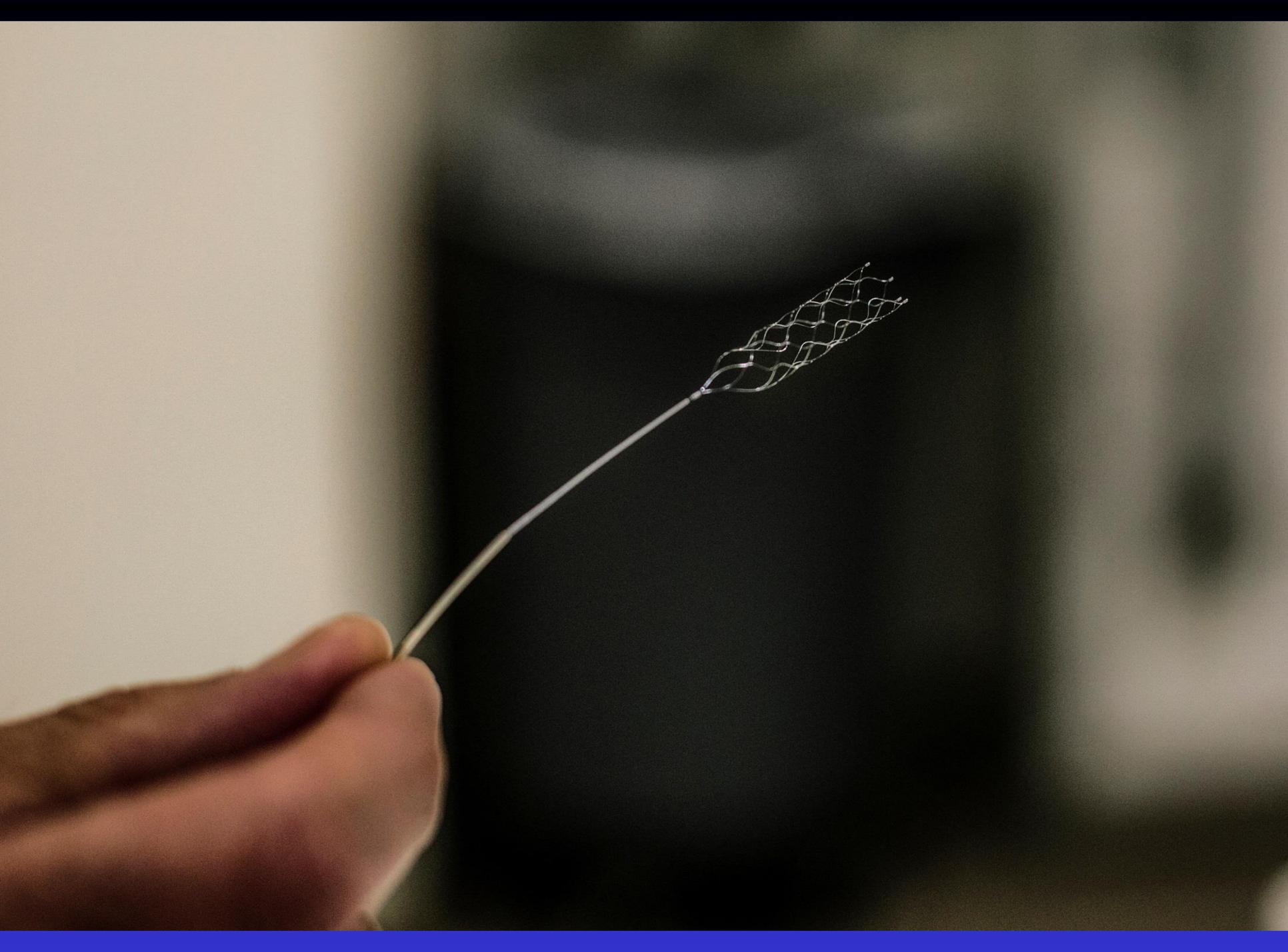
Re: N Engl J Med 2015;372:
11-20.

•Re: Published on February 11,
•2015, at NEJM.org..

IMS III versus MR CLEAN versus ESCAPE

Clinical outcome at 3 months

	IMS III		MR-CLEAN	
	Endo- vasc Rx	Control	Endo- vasc Rx	Control
mRS 0-2	33%	30%	60%	30%



Animation

Devices to treat acute ischemic stroke patients with arterial occlusion

Thrombectomy



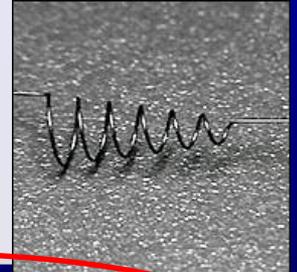
Angioplasty
balloon



Penumbra
aspiration

Thrombectomy
+ Retriever

Coil based
Merci



Stent based
Trevo/
Solitaire



2013 American Heart Association/American Stroke Association Guidelines for the Early Management of Patients With Acute Ischemic Stroke: (*Stroke*. 2013;44:870-947)

Patients eligible for intravenous rt PA should receive intravenous rt PA even if IA treatments are being considered.	Class I; Level of Evidence A
IA fibrinolysis is beneficial for treatment of carefully selected patients with major ischemic strokes of <6 hours' duration caused by occlusions of the MCA	Class I; Level of Evidence B

2015 American Heart Association/American Stroke Association Focused Update

(*Stroke*. 2015; 46: 3020-3035)

<p>Patients eligible for intravenous rt PA should receive intravenous rt PA even if IA treatments are being considered.</p>	<p>Class I; Level of Evidence A</p>
<p>Patients should receive endovascular therapy with a stent retriever if:</p> <ul style="list-style-type: none">a. Prestroke mRS score 0 to 1,b. Receiving intravenous r-tPA < 4.5 hrs,c. Causative occlusion of the ICA or proximal MCA (M1).d. Age ≥ 18 years,e. NIHSS score of ≥ 6,f. ASPECTS of ≥ 6, andg. Treatment can be initiated (groin puncture) <u>within 6 hours of symptom onset</u>	<p>Class I; Level of Evidence A</p>



If better is possible,
good is not enough.

Benjamin Franklin

2018

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

JANUARY 4, 2018

VOL. 378 NO. 1

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*

ORIGINAL ARTICLE

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

G.W. Albers, M.P. Marks, S. Kemp, S. Christensen, J.P. Tsai, S. Ortega-Gutierrez, R.A. McTaggart, M.T. Torbey, M. Kim-Tenser, T. Leslie-Mazwi, A. Sarraj, S.E. Kasner, S.A. Ansari, S.D. Yeatts, S. Hamilton, M. Mlynash, J.J. Heit, G. Zaharchuk, S. Kim, J. Carrozzella, Y.Y. Palesch, A.M. Demchuk, R. Bammer, P.W. Lavori, J.P. Broderick, and M.G. Lansberg, for the DEFUSE 3 Investigators*

DAWN AND DIFFUSE 3 trials

DAWN

within 6-16
hours

**Endovasc
Rx**

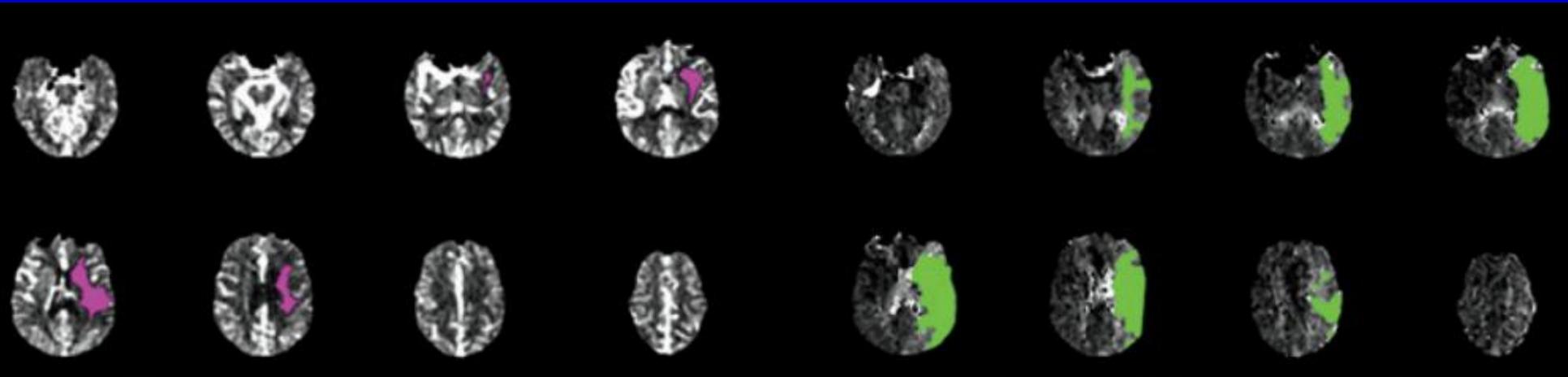
**Medical
Rx**

DIFFUSE

within 6 to 24
hours

**Endovasc
Rx**

**Medical
Rx**



Volume of Ischemic Core, 23 ml

Volume of Perfusion Lesion, 128 ml



IMS III versus MR CLEAN versus ESCAPE

Clinical outcome at 3 months

	IMS III		MR-CLEAN		DIFFUSE	
	Endo- vasc Rx	Control	Endo- vasc Rx	Control	Endo- vasc Rx	Control
mRS 0-2	33%	6%	60%	30%	44%	8%

How Safe is Interventional stroke Procedure ?

- Symptomatic ICH - 7.7%
- No more than IV tPA
even combined

2018 American Heart Association/American Stroke Association Focused Update

(*Stroke*. 2018; 49)

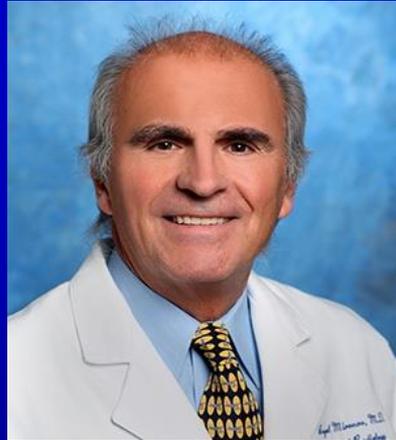
In selected patients with AIS within 6 to 24 hours of last known normal who have LVO in the anterior circulation and meet other DAWN or DEFUSE 3 eligibility criteria, mechanical thrombectomy is recommended.

Future

AI



Neuro-Intervention Team



Conclusions

- ❑ STROKE CAN BE TREATED
- ❑ TIME IS BRAIN
- ❑ WE ARE STRONGER TOGETHER



Thank you.

Questions ?

vbjani@yahoo.com