Interventional Stroke Treatment

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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%
• Each **Minute**  
  **1.9 million** neurons loss

*Stroke Treatment before 1990s*
1983 to 1996

Intravenous Thrombolysis

• Urokinase.

• Streptokinase.

• Tissue plasminogen activator.
Safety / Success

- **6%**: Bleed
- **30%**: Success - small clot
- **3%**: Success - large clot
• Intra arterial Tissue plasminogen activator
Devices

Thrombectomy

Angioplasty
balloon

Penumbra
aspiration

Thrombectomy
+ Retriever

Coil based
Merci

YEAR 1996 to YEAR 2013

| IMS III | MR-REScue | SYNTHeSIS
EXPANSION |
<table>
<thead>
<tr>
<th></th>
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</tr>
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<tbody>
<tr>
<td>Eligible patients who had received IV rt-PA within 3 hours after symptom onset</td>
<td>Patients with large-vessel, anterior-circulation occlusion within 8 hours after symptom onset</td>
<td>Patients within 4.5 hours after symptom onset</td>
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Endovasc Rx | IV rt-PA only | Endovasc Rx | Standard Rx | Endovasc Rx | IV rt-PA only |

### YEAR 1996 to YEAR 2015

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<th>Standard Rx</th>
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</tr>
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<tbody>
<tr>
<td>Endovasc</td>
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### Summary of trials: clinical outcome at 3 months

<table>
<thead>
<tr>
<th>mRS 0-2</th>
<th>IMS III</th>
<th>MR-RESCUE</th>
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<tbody>
<tr>
<td>43%</td>
<td>**</td>
<td>40%</td>
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1996 to 2015

*Endovascular treatment remains UNPROVEN*
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)

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

IMS III, MR CLEAN, and ESCAPE trials

<table>
<thead>
<tr>
<th>IMS III</th>
<th>MR-CLEAN</th>
<th>ESCAPE</th>
</tr>
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<tbody>
<tr>
<td>Eligible patients who had received IV rt-PA within 3 hours after symptom onset</td>
<td>Patients with large-vessel, anterior-circulation occlusion within 6 hours after symptom onset</td>
<td>Patients with small infarct core + anterior circulation occlusion + moderate-to-good collaterals within 12 hours after symptom onset</td>
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</tbody>
</table>

Endovasc Rx | IV rt-PA only | Endovasc Rx | Standard Rx | Endovasc Rx | Standard Rx |
IMS III versus MR CLEAN versus ESCAPE

Clinical outcome at 3 months

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<tr>
<th></th>
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<tbody>
<tr>
<td>Endo-vasc Rx</td>
<td>Control</td>
<td>Endo-vasc Rx</td>
</tr>
<tr>
<td>mRS 0-2</td>
<td>33%</td>
<td>30%</td>
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Devices to treat acute ischemic stroke patients with arterial occlusion

Thrombectomy

Angioplasty balloon

Penumbra aspiration

Thrombectomy + Retriever

Coil based Merci

Stent based Trevo/Solitaire

Clot Removal Success: 61% 24% 86% 60%

Independent Functionality: 58% 33% 58% 22%

Nogueira RG. Lancet 2012;380:1231-1240

New generation stent retrievers: FDA approval in 2012
How Safe is Interventional stroke Procedure?

<table>
<thead>
<tr>
<th></th>
<th>MR-CLEAN</th>
<th></th>
<th>ESCAPE</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>With in 6 hours</td>
<td>Endo-vasc Rx</td>
<td>Control</td>
<td>Endo-vasc Rx</td>
<td>Control</td>
</tr>
<tr>
<td>Symptomatic ICH</td>
<td>7.7%</td>
<td>6.4%</td>
<td>3.6%</td>
<td>2.7%</td>
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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)*

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<tr>
<th>Patients eligible for intravenous rt PA should receive intravenous rt PA even if IA treatments are being considered.</th>
<th>Class I; Level of Evidence A</th>
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</table>
| Patients should receive endovascular therapy with a stent retriever if:  
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, | Class I; Level of Evidence A |

*If better is possible, good is not enough.*

*Benjamin Franklin*
DAWN AND DIFFUSE 3 trials

**DAWN**

- Patients with small infarct core
- + anterior circulation occlusion **within 6-16 hours** after symptom onset
- **Endovasc Rx**
- **Medical Rx**

**DIFFUSE**

- Patients with small infarct core
- + anterior circulation occlusion **within 6 to 24 hours** after symptom onset
- **Endovasc Rx**
- **Medical Rx**
### IMS III versus MR CLEAN versus ESCAPE

**Clinical outcome at 3 months**

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<thead>
<tr>
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### How Safe is Interventional stroke Procedure?

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<tr>
<td>2018</td>
<td>DAWN</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>DIFFUSE 3</td>
<td>NA</td>
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**2018 American Heart Association/American Stroke Association Focused Update**

*Stroke. 2018; 49*

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

**Class I; Level of Evidence A**

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

**Class II; Level of Evidence B**
Neuro-Intervention Team

Conclusions

- STROKE CAN BE TREATED
- TIME IS BRAIN
- WE ARE STRONGER TOGETHER
Thank you.