Evidence for Mechanical Thrombectomy For Acute Ischemic Stroke

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Disclosure

Speaker name:

I have the following potential conflicts of interest to report:

- Honorarium: Toshiba
- Institutional Grant/Research Support: Toshiba
Public Health Impact of Stroke

Amazing Parallels with AMI

• 4th leading cause of death in US, 2nd worldwide

• Leading cause of long-term care disability
  – Most prevalent neurologic condition
  – Most common discharge diagnosis to nursing homes
  – Most common diagnosis treated in rehab
  – $70 Billion Annually in US

Lloyd-Jones D, Circulation 2010
Plaque Rupture (AMI) vs Embolus

Thrombus lodges in the cerebral artery causing a stroke.

Thrombus in the carotid artery breaks off and travels to the cerebral artery in the brain.

Diseased carotid artery

Normal carotid artery
Rapid Reperfusion May Reduce Neurologic Deficit

*Just Like AMI*

- Reperfusion of the ischemic penumbra may reduce the extent of damage and improve recovery of function
- Time is Brain
Goal of Acute Stroke Treatment

*Just Like AMI*

- Restore blood flow to salvageable brain
- Reduce infarct volume
- Improve clinical outcomes
The Rumor

• Many called for the end of Endovascular Stroke therapy after the publication of 3 negative trials in NEJM in 2013
  – IMS III
  – SYNTHESIS
  – MR RESCUE

• These trials concluded that there is no difference between standard medical therapy and endovascular therapy
What did we learn

• Large Vessel occlusion = best target
• Stroke intervention is safe
• Modern Clot retrievers are effective
  – Only 5% of patients had modern therapy in these trials
The Truth
Stroke Intervention Works
Just Like AMI

• This year has seen the publication of 5 major studies evaluating the role of endovascular therapy in stroke treatment
  – MR CLEAN
  – EXTEND-IA
  – ESCAPE
  – SWIFT PRIME
  – REVASCAT
• ALL 5 trials stopped because of significant benefit in the Endovascular arms
Interventions in Cardiology

• Current status of stroke neurointerventions reminiscent of the evolution of PCI procedures for AMI
• Thrombolysis evolved to PCI as…
  – Technology improved
  – Data showed efficacy
  – Cardiologists adapted to change
What is a Stentreiver?

A Stent Attached to a Wire
Why it matters

Saver JL, Stroke 2013;44:270-277

Stent retrievers
What Made These Trials Different?

- Confirmation of large vessel occlusion
- Use of retrievable stents in the majority of patients
MR CLEAN
Netherlands

• Proximal anterior circulation occlusion
• Randomized to endovascular therapy or usual care within 6 hrs of symptom onset (90% received IV tPA)

• RESULTS:
• Endovascular showed improvement in functional independence at 90 days
  – 32.6% vs 19.1% (95% CI, 5.9 to 21.2)
• No significant difference in mortality
• No significant difference in symptomatic ICH
ESCAPE
Canada

- Proximal anterior circulation occlusion
- Randomized to endovascular therapy or usual care within 12 hrs of symptom onset

RESULTS:
- Endovascular showed improvement in functional independence at 90 days
  - 53% vs 29.3% (P<0.001)
- Improvement in mortality in endovascular group
  - 10.4%, vs. 19.0% (P=0.04)
- No significant differences in the occurrence of symptomatic ICH
ESCAPE
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EXTEND-IA

Australia

- Proximal anterior circulation occlusion
- Randomized patients who received IV-tPA to undergo endovascular therapy with Solitaire or continue receiving IV-tPA alone

RESULTS:
- Endovascular showed improvement in functional independence at 90 days
  - 71% vs 40% (P = 0.01)
- No significant differences in mortality or the occurrence of symptomatic ICH
- NNT = 3
SWIFT PRIME
Medtronic- US

- Proximal anterior circulation occlusion
- Randomized patients who received IV-tPA to undergo endovascular therapy with Solitaire or continue receiving IV-tPA alone

RESULTS:
- Endovascular showed improvement in functional independence at 90 days
  - 60.2% vs 35.5%, P<0.001
- No significant differences in mortality or the occurrence of symptomatic ICH
- NNT = 4
REVASCAT
Medtronic- Spain

• Proximal anterior circulation occlusion
• Randomly assigned patients within 8 hrs of symptom onset to receive medical therapy alone or endovascular therapy with Solitaire retrievable stent

• RESULTS:
• Endovascular showed improvement in functional independence at 90 days
  – 43.7% vs. 28.2% (95% CI, 1.1 to 4.0)
• No significant differences in mortality or the occurrence of symptomatic ICH
What’s the point?

• Documented large vessel occlusion
• Use of contemporary (and successful/reliable) endovascular techniques
• Intervention works...Just Like AMI !!
Critics

Additional imaging & endovascular evaluation delays treatment
Endovascular Triage and Therapy Does Not Delay Treatment Initiation

<table>
<thead>
<tr>
<th>Study</th>
<th>From symptom onset to IV tPA*</th>
<th>From symptom onset to groin puncture</th>
<th>From groin puncture to recanalization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Endovascular</td>
<td>IV tPA Alone</td>
<td></td>
</tr>
<tr>
<td>MR CLEAN(^{30})</td>
<td>85 (67-110)</td>
<td>87 (65-116)</td>
<td>260</td>
</tr>
<tr>
<td>EXTEND-IA(^{33})</td>
<td>127 (93-162)</td>
<td>145 (105-180)</td>
<td>210</td>
</tr>
<tr>
<td>ESCAPE(^{31})</td>
<td>110 (80-142)</td>
<td>125 (89-183)</td>
<td>185</td>
</tr>
<tr>
<td>SWIFT PRIME</td>
<td>110.5 (85-156)</td>
<td>117 (80-155)</td>
<td>224</td>
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<tr>
<td>REVASCAT</td>
<td>117.5 (90-150)</td>
<td>105 (86-137.5)</td>
<td>269</td>
</tr>
</tbody>
</table>

\(^{*}\) IV tPA: Intravenous tissue plasminogen activator
SUMMARY

• We have established that endovascular treatment adds major benefit

• The Challenge:
• To rapidly offer endovascular treatment to all eligible stroke patients
• WE NEED HELP
• Physiologic Imaging so that we can increase eligibility for treatment
• Improved Speed to recanalization
What are Perfusion Studies?

• Dynamic Studies – not single snap shot
• Physiology: Transit Time, Blood Flow, Blood Volume
• Ability to distinguish core (infarcted tissue) from penumbra (salvagable tissue)
• Individualize stroke treatment
Neuro One Protocol

• Perfusion
  – 50 cc at 5cc/s  19 volumes
• Equivalent to 1.5 NCCT Rad Dose
<table>
<thead>
<tr>
<th>Condition</th>
<th>rTTP</th>
<th>rCBF</th>
<th>rCBV</th>
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</thead>
<tbody>
<tr>
<td>None</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Art stenosis/occl with comp</td>
<td>Prolonged</td>
<td>Normal</td>
<td>Normal or Increased</td>
</tr>
<tr>
<td>Oligemic</td>
<td>Prolonged</td>
<td>&gt; 60%</td>
<td>&gt; 80%</td>
</tr>
<tr>
<td>Tissue at risk</td>
<td>Prolonged</td>
<td>&gt; 30%</td>
<td>&gt; 60%</td>
</tr>
<tr>
<td>Dead tissue</td>
<td>Strong</td>
<td>&lt; 30%</td>
<td>&lt; 30-40%</td>
</tr>
</tbody>
</table>

Tomandl, 2003; Mayer 2000; Koenig 2001
Mismatch
Clinical History

- 50 yo who woke up with left hemiplegia, dysarthria, and facial droop.
- NIHSS = 16.

- PMH - Anxiety disorder, tobacco dependence, alcohol dependence
1\textsuperscript{st} pull of the microcatheter with the retrieval device

Total intervention time ~20 min
Complete recanalization TICI-3 after 1 pull
• In the angio suite – the patient could lift his Rt arm antigravity, improved gaze, NIHSS 16 to 5 immediately

• POD#1 NIH -3

• POD#2– NIH -0
Clinical History

- 75 yo WM last seen normal at 10 pm, ? Issues at 2 am, awoke thrashing at 4 am with Right gaze preference and left HP, arrived at hospital 2 hours later
- NIHSS 18
Summary

• Clinical Exam
• Imaging Criteria – No ICH, No EIC, core < 1/3 territory at risk

• We are smarter than a stop watch
• Physiologic Imaging is the next frontier
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Thank you! Questions?