Dawn and Defuse 3: Thrombectomy in Stroke

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Disclosures

I have no financial conflicts of interest to disclose concerning this presentation
Statistics

In 2015 stroke deaths accounted for 11.8% of total deaths worldwide.
Roughly 795,000 strokes occur each year in the U.S.
Nearly 133,000 people die each year from a stroke in the U.S.
Stroke Death Rates in U.S.

Stroke Death Rate per 100,000, 35+, All Races/Ethnicities, Both Genders, 2014-2016

This map was created using the Interactive Atlas of Heart Disease and Stroke, a website developed by the Centers for Disease Control and Prevention, Division for Heart Disease and Stroke Prevention. http://www.cdc.gov/nchs/maps/atlas
Statistics

In 2010, Oklahoma had the 4th highest death rate due to stroke in the U.S.
Stroke is the leading cause of serious long term disability in the U.S.
What is a stroke?

- **Stroke** – abrupt onset of neurological impairment due to vascular insult resulting in permanent cerebral infarction

- **TIA** – abrupt onset of neurological impairment due to vascular insult NOT resulting in permanent cerebral infarction
"I can't feel my face when I'm with you!"

It's a stroke.

You're having a stroke.

Signs of Acute Stroke
- unilateral facial droop
- forehead spared

Drooping eye
Loss of nasolabial fold
Drooping corner of mouth

just girly things
when boys do that adorable half smile.
Types of Stroke

Hemorrhagic: 17%
Ischemic: 83%

AMA/AHA Heart Disease and Stroke Statistics 2018
Evolution of Stroke Management

- NINDS tPA trial 0-3 hrs N=624
  - Intravenous thrombolysis
  - PROACT I, PROACT II

- ECASS III
  - FDA approval of MERCI, PENUMBRA

- DIAS, DEDAS, DIAS-2, DIAS-3
  - FDA approval of Stent Retrievers: Solitaire and Trevo

- TNK Parson et al
  - IMS-III SYNTHESIS MR RESCUE
  - MR CLEAN ESCAPE SWIFT PRIME REVASCAT EXTEND 1A THRACE THERAPY

- IST-3

- ENCHANTED
  - TNK - ATTEST

- EXTEND 1A-TNK-Part 2, TASTE, TWIST

- TNK NOR-TEST

- EXTEND 1A TNK

- DAWN DEFUSE 3

Ann Indian Acad Neurol, 2019 22(1) p. 6-12
39.4% That is how much the U.S. age-standardized stroke mortality rate declined between 1999 and 2016. This number translates to lives saved across the nation.
Early Management of Acute Ischemic Stroke

- Identify Symptoms
- Time of Onset
- Blood Pressure
- Blood Glucose
- NPO

- Determine Eligibility for tPA and/or Endovascular therapy
tPA Inclusion Criteria

- Diagnosis of ischemic stroke causing measurable neurologic deficit
- Onset of symptoms < 3 hours before beginning treatment
- 18 or older
tPA Exclusion Criteria

- Head Trauma or Prior CVA within 3 months
- Suspicion of SAH
- Non-compressible site arterial puncture within 7 days
- Intra-cranial Neoplasm, AV Malformation, Aneurysm
- Recent Intracranial or Spinal Surgery within 3 months
- Blood Pressure > 185/110 despite treatment
- Active Internal Bleeding
- Active Bleeding Diathesis
  - Platelets < 100,000
  - Heparin within 48 hours
  - Use of Warfarin with INR > 1.7
  - Use of NOAC within 48 hours
- Blood Glucose < 50
- CT Head with multi-lobar infarction with > 1/3 of hemisphere involved
- Minor or Rapidly improving non-disabling symptoms
- Pregnancy
- Seizure at onset
- Major surgery or serious trauma within 14 days
- Recent GI or GU bleeding within 21 days
- Recent AMI

Is Three Hours the Cutoff?

- ECASS-3 resulted in scientific advisory to use tPA within 3-4.5 hour window.
- OFF-label use
- REQUIRES consent form.
- Few additional **exclusion** criteria:
Additional Exclusion Criteria

- Age >80
- History of prior stroke AND diabetes
- Anticoagulation Use
- NIHSS >25
- CT findings >1/3 MCA territory
  - Hypodensity
  - Sulcal effacement
  - Mass effect
Extending the Time Window

<table>
<thead>
<tr>
<th>Time Window</th>
<th>Benefit per 100</th>
<th>Harm per 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–3 Hours</td>
<td>NINDS tPA Trial</td>
<td>32.3</td>
</tr>
<tr>
<td>3–4.5 Hours</td>
<td>ECASS 3 Trial</td>
<td>16.4</td>
</tr>
</tbody>
</table>

Number Needed to Benefit = 6.1
Number Needed to Harm = 37.5

Stroke, 2009; 40(7): 2433-2437
Every Minute Counts

1.9 million Neurons are Lost per Minute during an Acute Stroke

AMA/AHA Heart Disease and Stroke Statistics 2018
Administration of tPA

- Stabilize Patient
- Draw Labs: CBC, PT, PTT, INR, FSBS
- CT Head w/o Contrast
- Place Two Large Bore IV Catheters
- Place Foley Catheter
- Calculate Dose and Mix Drug
Evolution of Endovascular Therapy

PROACT II, MERCi, PENUMBRA, IMS III SYNTHESIS EXPANSION

Intra-arterial fibrinolysis, Ultrasound, Coil retrievers, Aspiration, Stent retrievers


**MERCI (2004) 1st Generation**

Engage the thrombus with deployment of a ‘corkscrew’ distal tip then remove en bloc. Proximal balloon inflation allows device retrieval into the guide while minimizing the risk of emboli.
PENUMBRA (2009) 2nd Generation

The penumbra aspiration system involves maceration of the thrombus with a separator under direct aspiration to prevent showering of fragments. Once the catheter system is delivered to the target vessel, ongoing clot maceration is performed without the need to re-access.
STENTRIEVER (early 2012)
3RD GENERATION
Engage the thrombus with stent retrieve deployment, which also temporarily restores flow across the occlusion. Proximal balloon inflation allows device retrieval into the guide while minimizing the risk of emboli.
## Endo-Vascular Trial Results

<table>
<thead>
<tr>
<th>RCT</th>
<th>MR CLEAN</th>
<th>ESCAPE</th>
<th>EXTEND-IA</th>
<th>SWIFT PRIME</th>
<th>REVASCAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>500 (267/233)</td>
<td>315 (150/165)</td>
<td>70 (35/35)</td>
<td>196 (98/98)</td>
<td>206 (103/103)</td>
</tr>
<tr>
<td>Baseline NIHSS (median)</td>
<td>18 (14–22) versus 17 (14–21)</td>
<td>17 (12–20) versus 16 (13–20)</td>
<td>13 (9–19) versus 17 (13–20)</td>
<td>17 (13–19) versus 17 (13–20)</td>
<td>17 (12–19) versus 17 (14–20)</td>
</tr>
<tr>
<td>Median stroke onset to groin puncture (min)</td>
<td>260</td>
<td>241</td>
<td>210</td>
<td>224</td>
<td>269</td>
</tr>
<tr>
<td>mRS (0–2) at 90 days %</td>
<td>19.1 versus 32.6</td>
<td>29.3 versus 53</td>
<td>40 versus 70</td>
<td>35.5 versus 60.2</td>
<td>28.2 versus 43.7</td>
</tr>
<tr>
<td>NNT</td>
<td>7.1</td>
<td>4.2</td>
<td>3.2</td>
<td>4.0</td>
<td>6.3</td>
</tr>
</tbody>
</table>