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Make Your Own Assessment

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Why do we care about stroke?

• Third leading cause of death
• Leading cause of adult disability
• 20-30% mortality
Middle Cerebral Infarction
Tissue-Plasminogen Activator in Acute Ischemic Stroke

- Double-blinded
- Placebo controlled
- 0.9mg/kg
- 624 patients
- Treated within 3 hours
  - 1/2 within 90 minutes
  - 1/2 within 91-180 minutes
- 4 Outcome measures

NINDS rt-PA Stroke Trial Results

• 30% more likely to have favorable 3-month outcome
  – 1.9 (1.2-2.9)=Odds Ratio (0-90 minutes)
  – 1.7 (1.3-2.9)=Odds Ratio (91-180) minutes

• Significantly higher intracerebral hemorrhage rate
  – 0.6% Placebo
  – 6.4% rt-PA

• No difference in mortality
  – 21% Placebo
  – 17% rt-PA
Time to Treatment

- $3 \text{ hrs}$ = therapeutic window
- $5.7 \text{ hrs}$ = median time to ED arrival
- $3.6\%$ = % treated in NINDS (624 of 17,324)
Stroke Chain of Survival & Recovery

- Detection: Early Recognition
- Dispatch: Early EMS Activation
- Delivery: Transport & Management
- Door: ED Triage
- Data: ED Evaluation & Management
- Decision: Specific Therapies
- Drug: Thrombolytic & Neuroprotective Therapy
Detection

- **What are Signs & Symptoms?**
  - 43% general public didn’t know any
  - 39% of acute stroke patients didn’t know any

- **What are Risk Factors?**
  - 32% general public didn’t know any
  - 43% of acute stroke patients didn’t know any
What do you need to know about stroke?

• Signs & Symptoms
  – one-sided extremity weakness
  – one-sided numbness
  – difficulty speaking
  – visual problems

• Risk Factors
  – hypertension
  – diabetes mellitus
  – smoking
  – heart disease
  – prior strokes
  – older age
  – race (African-Americans)
Cincinnati Prehospital Stroke Scale

Facial Droop

Normal: Both sides of face move equally
Abnormal: One side of face does not move at all

Arm Drift

Normal: Both arms move equally or not at all
Abnormal: One arm drifts compared to the other

Speech

Normal: Patients use correct words with no slurring
Abnormal: Slurred or inappropriate words or mute
Dispatch: Call 911
General Publics’ Perception of What to do in Case of a Stroke

• 90% would seek medical attention
  – 43% call 911 immediately
  – 26% call their family doctor
  – 11% go straight to the ED
Initial Medical Contact versus Time of ED Arrival

Barsan Arch Intern Med. 1993
Delivery: Transport & Management

- ABCs
- Stroke recognition
- Time of onset
- Neurological evaluation
- Check glucose
- Early hospital notification
- Rapid Transport!!!!!!
Emergency Department Management

- Door: ED Triage
- Data: ED Evaluation
- Decision: Specific Therapies
- Drug: Thrombolytic Therapy
Triage

Shantoo, Wikimedia Commons
Data
Decision
(Who Should I Treat?)

• Inclusion Criteria
• Exclusion Criteria
Inclusion Criteria

• Clinical Presentation of Ischemic Stroke
• Onset within 3 hours
Exclusion Criteria

- **Onset >3 hours**
- **BP>185/110**
- Hemorrhage on CT
- **Seizure at onset**
- Surgery 14 days
- Trauma 3 months
- Stroke 3 months
- Minimal or resolving symptoms

- GI/GU bleed 21 days
- Prior ICH or SAH
- **Recent MI**
- On Coumadin PT>1.5
- On heparin PTT>21
- Platelets <100,000
- **Glucose >400**
Drug

(How Do You Treat?)

• Pre-Treatment
  – glucose, NIHSS, CT, Consent
• Dosing
• Monitoring
Dosing

- 0.9 mg/kg (max. = 90 mg)
- 10% bolus (over 1 minute)
- 1 hour infusion
Patient Monitoring

• ICU admission (24 hours)
• Neuro checks
  – Q 15 minute X 6 hours
  – Q 1 hour X 18 hours
• BP checks
Blood Pressure Management

• Non-Thrombolytic Candidates

• Thrombolytic Candidates
  – pre-treatment (185/110 mmHg)
  – during & post-treatment
BP Management

• Non-Thrombolytic Candidate
  – Don’t Treat!!!

• Pre-Thrombolysis
  – Be Gentle!!!

• During & Post-Thrombolysis
  – Be Aggressive!!!
NINDS-Recommended Targets

• Door-to-doctor 10 minutes
• Door-to-CT 25 minutes
• Door-to-CT reading 45 minutes
• Door-to-treatment 60 minutes
Stroke Chain of Survival & Recovery

• Detection: Early Recognition
• Dispatch: Early EMS Activation
• Delivery: Transport & Management
• Door: ED Triage
• Data: ED Evaluation & Management
• Decision: Specific Therapies
• Drug: Thrombolytic & Neuroprotective Therapy
3-Month Favorable Outcome

Number of Patients

Placebo

rt-PA

ICH Deaths and Mortality

Number of Patients

Placebo
ICH Deaths: 0.3
Mortality: 21

rt-PA
ICH Deaths: 3
Mortality: 17

Baseline NIHSS and ICH in the NINDS Trial

Percentage of t-PA Patients with Symptomatic ICH

(Broderick, Stroke 1997)
## Disposition Results from NINDS Trial

<table>
<thead>
<tr>
<th>Disposition</th>
<th>rt-PA n=312</th>
<th>Placebo n=312</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS (mean days +SD)</td>
<td>10.88±10.04</td>
<td>12.41±11.10</td>
<td>0.02</td>
</tr>
<tr>
<td>Disposition</td>
<td></td>
<td></td>
<td>0.002*</td>
</tr>
<tr>
<td>Home</td>
<td>151 (48%)</td>
<td>112 (36%)</td>
<td></td>
</tr>
<tr>
<td>Rehab unit</td>
<td>91 (29%)</td>
<td>115 (37%)</td>
<td></td>
</tr>
<tr>
<td>Nursing home</td>
<td>22 (7%)</td>
<td>39 (13%)</td>
<td></td>
</tr>
<tr>
<td>Dead</td>
<td>35 (11%)</td>
<td>40 (13%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>13 (4%)</td>
<td>6 (2%)</td>
<td></td>
</tr>
</tbody>
</table>

*compared home to all other dispositions*

*Neurology 1998;50*
## Extending the Therapeutic Window

<table>
<thead>
<tr>
<th></th>
<th>Outcome 3-month$</th>
<th>ICH symp.</th>
<th>Mortality 3-month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATLANTIS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>tPA</em></td>
<td>33%</td>
<td>6.7%*</td>
<td>10.9%</td>
</tr>
<tr>
<td><em>placebo</em></td>
<td>33%</td>
<td>1.1%*</td>
<td>6.9%</td>
</tr>
<tr>
<td><strong>ECASS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>tPA</em></td>
<td>36%</td>
<td>20%*</td>
<td>18%*</td>
</tr>
<tr>
<td><em>placebo</em></td>
<td>29%</td>
<td>7%*</td>
<td>13%*</td>
</tr>
<tr>
<td><strong>ECASS II</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>tPA</em></td>
<td>40.3%</td>
<td>8.8%*</td>
<td>10.5%</td>
</tr>
<tr>
<td><em>placebo</em></td>
<td>36.6%</td>
<td>3.4%*</td>
<td>10.7%</td>
</tr>
</tbody>
</table>

$\% \text{ mRankin } 0-1 \text{ for ECASS I & II, NIHSS}<1 \text{ for ALANTIS at 3-months}$
### Randomized Streptokinase Trials

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Time to Treat</th>
<th>Treatment</th>
<th>ICH</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK</td>
<td>228</td>
<td>&lt;4 hrs</td>
<td>SK+ASA</td>
<td>NA</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ASA</td>
<td>NA</td>
<td>22%</td>
</tr>
<tr>
<td>MAST-E</td>
<td>270</td>
<td>≤6 hrs</td>
<td>SK</td>
<td>18%</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Placebo</td>
<td>3%</td>
<td>18%</td>
</tr>
<tr>
<td>MAST-I</td>
<td>622</td>
<td>≤6 hrs</td>
<td>SK+ASA</td>
<td>10%</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SK</td>
<td>6%</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ASA</td>
<td>2%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Placebo</td>
<td>0.6%</td>
<td>13%</td>
</tr>
</tbody>
</table>