Acute Stroke: Diagnosis and Management
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Disclosures
• None

Learning Objectives
• Identify signs/symptoms of stroke
• Review the rapid assessment of stroke patients
• Discuss inclusion/exclusion of patients for tPA
Ischemic Stroke Definition

• Fixed focal neurological deficit attributable to arterial or venous territory, typically lasting longer than 24 hours with evidence of acute infarction.
• So what’s a TIA?
  – a brief episode of neurological dysfunction caused by focal brain or retinal ischemia, with clinical symptoms typically lasting less than one hour, and without evidence of acute infarction

But I am not a neurologist. Why should I care?

• 4th leading cause of death (behind heart disease, cancer, and chronic lower pulmonary disease)
• Leading cause of functional impairment
  – 20% require institutional care after three months
  – 15-30% permanently disabled
  – 2010 cost of stroke estimated at 73.7 BILLION
  • Mean lifetime cost of $140,048
Case Presentation

- 56 yo M with an acute onset of left sided weakness and neglect while on flight from St. Louis to Salt Lake
- Medical hx: DVT, HTN
- Family Hx: son with “hypercoagulable state.”

Stroke Treatment Timeline
- Time noted with flying
- In hospice bed
- ED Arrival (Time of Chest) – Left inferior
- CT Head
  - EKG, lab work, pharmacy
- CT Head -

IV tPA ADMINISTERED 5:06
DOOR to TPA 5 minutes (GOAL 45 minutes)
Patient gets pain free in 15 minutes (Goal is 90 minutes)
Cortex

- Motor findings variable
- Motor + sensory findings in similar distribution
- Aphasia
- Cognitive issues
- Neglect
- Apraxia
- Visual field deficits
- Gerstmann's syndrome
  - Acalculia
  - Left-right disorientation
  - Finger agnosia
  - Agraphia
- Higher level sensory processing

Subcortical

- Face + arm + leg symmetrically
- Acute onset movement disorders
- Common syndromes
  - Clumsy hand dysarthria
  - Ataxia hemiparesis
  - Pure motor hemiparesis
  - Hemi sensory loss
  - Mixed sensory-motor

Stroke Syndromes, in short...

- ACA
  - LEGS
- MCA
  - Contralateral face/arm > leg weakness
  - Contralateral face/arm > leg numbness
  - Aphasia – Broca's OR Wernicke's OR transcortical
  - Neglect (non-dominant)
  - Contralateral Visual Field Defects
  - Gaze deviation IPSI to side of lesion (away from hemiparetic side)
- PCA
  - Contralateral sensory loss
  - Cognitive dysfunction
  - Visual dysfunction – contra homonymous hemianopia
  - Visual agnosia
Posterior Circulation

- Nystagmus
  - Changing directions
- Cranial nerve deficits
  - 6 & 7 often go together
- Double vision
  - Can be a 3, 4, 6th or a “skew”
- Gait instability
- Coma

How much of an exam should be done to figure these out?

- NIHSS only
- Additional examination only if there is a question about diagnosis
  - Walking patients with a suspected posterior circulation stroke
3 Hour Window Exclusions

- Age <18
- Minor/mild symptoms or spontaneously clearing
- Seizure at onset
- Other stroke/serious head trauma in last 3 months
- Major surgery or severe head trauma in last 14 days
- Known history of ICH
- Sustained SBP >185 or DBP >110
- Signs suggestive of SAH even if NCCT is negative
- GI or GU hemorrhage in last 21 days
- Arterial puncture at noncompressible site
- Hypo in last 48 hours AND elevated PTT
- Oral anticoag w/INR >1.7 or PT >15
- Pts <100/90
- Glucose <50 or >400
- Lasting/suspected to be pregnant
- Clinical presentation w/ acute MI or post-MI pericarditis
- Active bleeding or acute trauma (5+) on exam
- Hypodensity >1/3 of cerebral hemisphere
- Intracranial neoplasm, AVM, aneurysm

4 ½ Hour Window Exclusion

- Age <18 or >80
- NIHSS >25
- Previous stroke and diabetes
- Oral anticoagulant use
- Minor surgery/severe trauma in past 3 months

What are the risks and benefits to tPA?

- 3 hours:
  - 6.4%
- 4.5 hours:
  - 8% risk of bleeding

Benefit?

"Every drug has risks and benefits. For this drug, you have an XXX risk of bleeding, the most serious of which is inside your brain. However, there is a 30% better chance of little or no disability at 3 months."
Increased Risk of sICH

- Baseline stroke severity on NIHSS
- Brain edema (hypodensity) on CT
- Mass effect on CT
- Protocol violations
- Elevated serum glucose or history of diabetes
- Advanced age
- Increased time to treatment
- Low platelet count
- History of CHF
- Low plasminogen activator inhibitor levels (research)
- Large DWI Volume


Is tPA safe in the community?

<table>
<thead>
<tr>
<th>Year</th>
<th>Series</th>
<th>N (t-PA)</th>
<th>t-PA mg/kg</th>
<th>S. ICH</th>
<th>T. ICH</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>NINDS, 3 h</td>
<td>624 (312)</td>
<td>0.9</td>
<td>6.4%</td>
<td>—</td>
<td>39% t-PA</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6% Pl.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.6% Pl.</td>
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<tr>
<td>1997</td>
<td>ECASS-II 6 h</td>
<td>800 (409)</td>
<td>0.9</td>
<td>8.8% t-PA</td>
<td>40.3% t-PA</td>
<td>3.4% Pl.</td>
</tr>
<tr>
<td>1997</td>
<td>ECASS-II Post hoc</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>54.3% t-PA</td>
<td>—</td>
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<tr>
<td>1998</td>
<td>Houston, 3 h</td>
<td>30</td>
<td>0.9</td>
<td>7%</td>
<td>10%</td>
<td>50% t-PA</td>
</tr>
<tr>
<td>1998</td>
<td>Cologne, 3 h</td>
<td>100</td>
<td>0.9</td>
<td>5%</td>
<td>11%</td>
<td>40% t-PA</td>
</tr>
<tr>
<td>1999</td>
<td>Lyon, 3 h, 6 h</td>
<td>100</td>
<td>0.8</td>
<td>7%</td>
<td>11%</td>
<td>45% t-PA</td>
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<td>2000</td>
<td>STAIRS, 3 h</td>
<td>500</td>
<td>0.9</td>
<td>9.3%</td>
<td>36% t-PA</td>
<td>33% t-PA</td>
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<tr>
<td>2000</td>
<td>Vannes, 7 h</td>
<td>46</td>
<td>0.9</td>
<td>2.2%</td>
<td>36% t-PA</td>
<td>43% t-PA</td>
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<td>2001</td>
<td>Bari, 3 h</td>
<td>75</td>
<td>0.9</td>
<td>7.7%</td>
<td>—</td>
<td>40% t-PA</td>
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<tr>
<td>2001</td>
<td>Calgary, 3 h</td>
<td>84</td>
<td>0.9</td>
<td>3.3%</td>
<td>54% t-PA</td>
<td>—</td>
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<tr>
<td>2001</td>
<td>Houston, 3 h</td>
<td>200</td>
<td>0.9</td>
<td>3.6%</td>
<td>54% t-PA</td>
<td>—</td>
</tr>
<tr>
<td>2002</td>
<td>GSMR, 3 h</td>
<td>1089</td>
<td>0.9</td>
<td>4.6%</td>
<td>46% t-PA</td>
<td>—</td>
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<td>2003</td>
<td>Lyon, 3 h</td>
<td>200</td>
<td>0.8</td>
<td>5.5%</td>
<td>35% t-PA</td>
<td>—</td>
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Case Presentation

• 76 yo with an acute onset of right sided weakness, aphasia and dysarthria while at church
• NIHSS 23
• Stroke alert by EMS 7 min prior to arrival – within goal < 10 min
• CT imaging at 9 min – within goal < 25 min
• CT interpretation at 22 min – within goal < 45 min
• PT/INR/PTT at 30 min – within goal < 45 min
• tPA at 35 min – within goal < 60 min

Blood Flow
Peak Enhancement
Blood Volume
Time to Start
Time to Peak
You’ve given tPA. NIHSS is still 20. Is there anything else you can do?

• MERCI Penumbra

Recanalization

• TCD studies show
  – Complete recanalization: 30%
  – Partial: 48%
  – Begin: 17 minutes (median)
  – Duration of recanalization: 23 +/- 16 minutes (mean)
  – Complete recanalization is faster than partial
    • 10 vs 30 minutes median
  – Re-occlusion in 34%
Questions??

References (if not on slide)