TO SHIP OR NOT TO SHIP

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Objectives

- Review tPA
- ED evaluation
- Transfer decision
- Summary
- Questions
Disclosures

- None
NINDS trial: Landmark study in 1995 marked the beginning of a revolution in stroke treatment

Funded by NIH

Conducted at 8 medical centers around the US

Small number of patients enrolled

This trial led to FDA approval of Alteplase in 1996

Met with great skepticism

100 mg vial costs about $8,000
A position statement from the American Academy of Emergency Medicine in 2002:

“objective evidence regarding the safety, efficacy, and applicability of tPA for acute ischemic stroke is insufficient to warrant its classification as standard of care”

Now widely accepted and standard of care world wide
Alteplase

- FDA prescribing information for CVA was revised in February 2015
- No new data was reviewed
- Many of the contraindications were changed to warnings or precautions
Stroke Death Rates

The graph shows the number of stroke deaths in thousands over the years from 1900 to 2013. The death rates have generally increased from 1900 to 1950, peaked around 1970, and then decreased until 2013.
Labeled indications:
- Ischemic stroke < 3 hours
- STEMI
- Massive pulmonary embolism
Off label indications:

- Ischemic stroke in the 3-4.5 hour window
- Sub-massive PE
- Frostbite
- Arterial/venous occlusion
- Prosthetic valve thrombosis
- Para pneumonic effusions
General contraindications per FDA

- Active internal bleeding
- Recent intracranial/spinal surgery or head trauma
- Severe uncontrolled HTN >185/110
- Bleeding diathesis
  - Thrombocytopenia
Prior version of FDA label did not recommend tPA for minor deficits
Also listed severe deficits (NIH>22) as increased risk
New label in 2015 removed both of these warnings
tPA: Rapidly improving sx

- IV tPA is reasonable for patients with moderate to severe ischemic stroke and early improvement but remain impaired and potentially disabled in the judgment of the examiner.
- Because benefit is time dependent, delaying treatment in order to monitor for further improvement is not recommended.
Reasons for tPA delay

- Most common is delay in presentation
  - <1/3 of eligible strokes arrive within 3 hours
  - Lack of recognition by patient or family
  - Slow adoption of treatment algorithms
  - Complexity of large system changes needed at the hospital or EMS level
The most important factor in successful thrombolytic therapy for acute ischemic stroke is early treatment.

32,000 brain cells lost per second during stroke

This is why it’s paramount for the patient to be taken to the nearest tPA ready hospital
ED Targets

- Door to physician < 10 minutes
- Door to stroke team < 15 minutes
- Door to CT < 25 minutes
- Door to CT result < 45 minutes
- DTN < 60 minutes
- Door to stroke unit admission < 3 hours
- Door to transfer < 90 minutes
ED Targets

- DTN ≤ 45 minutes?
  - Requires a robust stroke process with strict adherence to pre-set protocols

- DTN ≤ 30 minutes?
  - Requires experienced staff
A process that allows the rapid evaluation and treatment of acute stroke patients

Team approach involving multiple staff and departments
Suspected Acute Ischemic Stroke

< 3hrs

CT or MR

> 3hrs

CTA, CTP
MRA, PWI-DWI

Visible Clot or Penumbra?

Yes

Consider: IA lytics or devices
Off-label IV tPA

No

Other Rx Trials
Supportive Care

IV tPA Candidate?

No

Yes

0.9 mg/kg IV tPA

CTA, MRA

Large Vessel Clot?
Emergency Room
ED RN
Critical Resource Nurse
Patient Care Technician
Lab
ED Physician → Neurologist
CT technician
Radiologist
Pastor
House supervisor
Program manager
Blood is labeled with a special color tag to help ensure lab recognizes the priority
Multi-departmental alert to allow the CT techs to prepare the scanner
Radiologist aware of incoming study
Mobilizes additional staff (critical resource nurse) to assist with care
Code Stroke

- **Triage**
  - Chief Complaint
  - Symptom onset (Last known well)
  - Vital signs
  - Glucose POC, iSTAT INR, Cr

- Patient is taken directly to CT scanner

- After CT scan the pt is taken to their ED room to complete workup
Prehospital Activation

- Code Stroke can be activated by EMS
- Patient goes directly to CT
- Prehospital blood can be sent to lab
Imaging Modalities

- Non-contrast CT
- CT angio
- CT perfusion
- MRI
  - Rapid MRI protocol
The goals of CT in the acute setting are:
- exclude intracranial hemorrhage, which would preclude thrombolysis
- look for any features of ischemia/infarction
- exclude other intracranial pathologies that may mimic a stroke, such as tumor
Computed tomography (CT) perfusion imaging shows which areas of the brain are supplied or perfused adequately with blood and provides detailed information on delivery of blood or blood flow to the brain.

For patients presenting beyond the tPA-approved time window (3 or 4.5 hours), perfusion is also added to assess penumbra and collateral circulation.
CT Angio Head

- Indications:
  - Stroke
  - Dense MCA sign
  - Aneurysm
  - Dissection
  - Stenosis
  - Ateriovenous malformation (AVM)
CT Angio Neck

- Indications
  - Stroke
  - Carotid stenosis
  - Dissection
  - Tumor
MRI

- Increased sensitivity and specificity
- Increased imaging and interpretation times
- DWI
  - Diffusion weight imaging can detect extracellular water movement into the intracellular environment during ischemia, accompanied by swelling of cells and narrowing of the extracellular spaces.
TRANSFER?
These strokes are more severe and disabling
Key to treatment is endovascular therapy
- Intra-arterial tPA
- Clot retrieval devices
IV tPA is indicated prior to transfer
Transfer to a Comprehensive Stroke Center
Large Vessel Symptoms

- F - Field cut
- A - Aphasia
- N - Neglect
- G - Gaze Preference
- D - Dense Hemi-paresis
Wake up Stroke

- Time of onset unknown
- 20% of CVA’s
- Majority of these patients are excluded from IV reperfusion therapy and IA thrombectomy
- No treatment options?
Wake up Stroke

- Paradigm Shift:
  - Originally treated with routine medical management
  - Penumbral imaging

- Likely to benefit:
  - Small core
  - Large penumbra

- Unlikely to benefit:
  - Large core
  - Small penumbra
When to consider transfer

- Any hemorrhage
- Wake up stroke
- Failure of tPA
- Dense MCA sign
- Large vessel occlusion
Stroke Mimics

- Psychogenic
- Seizures
- Hypoglycemia
- Complex migraine
- Hypertensive encephalopathy
- Wernike’s encephalopathy
- CNS infections
- CNS tumor
- Drug toxicity
Stroke Mimics

- Account for up to 25% of stroke activations
- Common characteristics
  - Younger age
  - Lower NIH
  - Prior psychiatric history
  - Lack of risk factors
Remember “time lost is brain lost”

- tPA window is only 3-4.5 hours
- Interventional therapy window varies on severity and expertise level of staff
Advances in the last 20 years along with the designation and regionalization of stroke centers, along with protocols and national initiatives, have all resulted in improved recognition and treatment of stroke patients.
Conclusion

- Key for rapid DTN time
  - Have protocol in place
  - Educate staff
  - Educate and share data with EMS
  - Pre-hospital activation goes directly to CT
  - Walk in strokes go from triage to CT
  - POC labs
  - ED physician decides if tPA is given
  - ***PASSION***
Future research will focus on better imaging and interventional techniques
Questions?