Stroke Mimickers and the Atypical Stroke Patient

Bruce Lo, MD, RDMS
Associate Professor, EVMS
Chief, Department of Emergency Medicine
Sentara Norfolk General

Disclosures

☐ None

Objectives

☐ Examine atypical presentation of stroke and stroke mimics in the acute setting

☐ Create an algorithm for evaluating those with potential stroke mimickers

☐ Describe pitfalls in evaluating patients with potential stroke mimickers
No Brainer!

I think there's a leak...

WHAT ABOUT STROKE?
Background

- **Physician**
  - Misdiagnosis: up to 20%
  - Misdiagnosed as stroke: up to 20%

- **EMS**
  - (1995) 28% misdiagnosed as stroke
  - (2008) 83% Sensitivity; 42% PPV

- **Protocol Violations**
  - 30% EM
  - 5% Neurologist

31%* Admitted (possible) stroke patient – stroke mimickers

- **Mimics:** Seizures, encephalopathy, sepsis

Use of tPA
Safety and Outcomes of Intravenous Thrombolysis in Stroke Mimics
A 6-Year, Single-Care Center Study and a Pooled Analysis of Reported Series
Georgios Tsivgoulis, MD, Andrei V. Alexandrov, MD, Jason Chang, MD, Vijay K. Sharan, MD, Steven L. Biever, MD, Annabelle Y. Lao, MD, Wei Liu, MD, Eftihios Stamoulakis, MD, Anne W. Alexandrov, PhD, Marc D. Mullof, MD, James L. Frey, MD

Table 1. Prevalence and Outcomes of 826 Acute Brain Attack Patients Treated With IIT Across Different Stroke Syndromes

<table>
<thead>
<tr>
<th>Registry</th>
<th>IIT (%)</th>
<th>IIT (%f)</th>
<th>IIT (%f, %)</th>
<th>IIT (%f, %f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>75%</td>
<td>50%</td>
<td>50%</td>
<td>25%</td>
</tr>
<tr>
<td>Ischemic</td>
<td>90%</td>
<td>60%</td>
<td>60%</td>
<td>30%</td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>70%</td>
<td>40%</td>
<td>40%</td>
<td>20%</td>
</tr>
<tr>
<td>Cerebral</td>
<td>80%</td>
<td>50%</td>
<td>50%</td>
<td>25%</td>
</tr>
<tr>
<td>Overall</td>
<td>80%</td>
<td>50%</td>
<td>50%</td>
<td>25%</td>
</tr>
</tbody>
</table>

*Table includes stroke mimic, IIT, Intravenous Thrombolysis with or without intravenous heparin, IIT, intravenous tPA. A functional independence defined as a modified Rankin Scale score of 0 to 1.58, not available.

- 10x more likely to be sued for NOT giving tPA
- 5x cases successfully sued for NOT giving tPA

Stroke Mimickers

**Neurological Conditions**
- Seizure with Todd's paralysis
- Brain Tumor
- Demyelinating disorder (eg MS)
- Myasthenia Gravis
- Bell's Palsy
- Complicated Migraines

**Cardiovascular Disorders**
- Syncope
- HTN Encephalopathy

**Psychiatric Disorders**
- Conversion Disorder
- Malingering
- Factitious Disorder

**Infectious Conditions**
- Viral encephalitis
- Basilar meningitis (eg TB)
- Brain Abscess

**Inner Ear Conditions**
- Labyrinthitis
- Vestibular neuritis
- BPV

**Metabolic**
- Severe hyponatremia
- Hypoglycemia
- Hyperglycemic hyperosmolar nonketotic state

Table 1. Prevalence and Outcomes of 826 Acute Brain Attack Patients Treated With IIT Across Different Stroke Syndromes

General Principles

- **Stroke**: NEGATIVE symptoms
- **Stroke Mimickers**: POSITIVE symptoms
- **Exceptions**:
  - Headache (think dissection/bleed)
  - Atypical presentation of stroke

Approach to Evaluation

- History...
- History...
- History...
- Exam
- Diagnostics
- When in doubt, assume the worst....

History and Physical Clues

- Fever
- Trauma
- Recurrent Seizures
- Weakness with atrophy
- Recurrent Headaches
- Effort Dependent
- Global symptoms
Head CT Scan

CTA and CTP

MRI – DWI/PWI
How good is MRI?

Magnetic resonance imaging and computed tomography in emergency assessment of patients with suspected acute stroke: a prospective comparison

- **Sensitivity for Acute Stroke:**
  - MRI: 83% (77-88%)
  - CT: 26% (20-32%)

- **Detected Acute Stroke:**
  - MRI: 46% (35-56%)
  - CT: 7% (3-14%)

Case #1

- 65 year old female with sudden onset of difficulty speaking and right sided weakness
- Started 1 hr ago
- History of DM, HTN
- Stable vital signs

#1: 65 y/o Slurred Speech

- Accucheck
- EMS BS: 175
- Real BS: 39
What about those Glucometers?

- ISO standard
  - 20mg/dL < 100 mg/dL; 20% > 100 mg/dL
- Falsey elevated
  - Anemia
  - High pH
  - Certain medications
  - Hypoxia
- Test Strip
- Operator Error

Symptoms: Bells Palsy

- Facial Paralysis (upper and lower)
- Decreased sensation in tongue
- Ear pain/Hyperacusis
- Facial numbness
- Caution: Headache/neck pain, CN neuropathies

$2 Million Lawsuit
Case #3

Complex Migraine

- Younger, females – recurrent headache/symptoms
- Vast majority have headaches
- May have radiographic changes
- Variants:
  - Basilar
  - Hemiplegic
  - Occular
  - Migrainous infarctions

- 27% (588/2196) with HA + Ischemic Stroke
- Increased Risk:
  - Younger Age
  - Female
  - History of Migraines
  - NORMAL BP
  - Cerebellar stroke

Stroke 2005; 36: e1-e3
Complex Migraine vs. Stroke

- Recurrent symptoms
- Cerebellar dysfunction
- Don’t assume migraine in first time symptoms

#4: 36 y/o Dysarthria

HPI
- Getting procedure in MD’s office
- “Situation occurs”
- 911 – transport to hospital

EXAM
- Stable vitals
- Dysarthria
- Unable to move right arm/leg

Case #4: 36 year old

- Inadvertent vascular injection of lidocaine
- Seizure
  - Dysarthria, weakness
- Todd’s Paralysis: Neurological deficit after seizure
  - Exhaustion/Inhibition of neurons
  - May last several days
Stroke Chameleons

- Movement disorders
  - Acute hemiballismus
- Seizures
- Sensory symptoms
- Acute confusion

#5 45 y/o from Jail

HPI
- Being booked at Police Station
- Became anxious
- Sudden onset of left side weakness/paresthesia
- No PMX; Denies drugs

EXAM
- Stable Vitals
- Unable to move left arm/leg
- No sensation to noxious stimulus to left arm/leg
Case #5: 45 y/o Jailbird

- Admitted
- Symptoms spontaneously improved
- Attempts to escape through the back door of unit

Not a stroke: Conversion Disorder

Conversion Disorder

- 10% initially diagnosed with stroke
- 20% stroke mimickers given tPA
- Diagnosis of exclusion
  - Likely have psychiatric co-morbidities

Conversion Disorder

- Rare
- Associated with: Significant stress, rural upbringing, younger, female (6:1 compared to male)
- Sometimes missed diagnosed for other illness
- Spontaneous recovery (15-74%)
- Diagnosis of exclusion

Stroke 2003, 71–76
Neurology 2010, 1340–1345
Brain 2010, 1537–51
Clues on Exam

Hoover Sign

Abductor Sign

Clues on Exam

- Sternocleidomastoid
- Rotates head to the opposite direction
Optokinetic Nystagmus Test

There's an App for that!!

Other Clues

- Generalized weakness
- Give way
- Eye movement
- Effort dependent

Case #6A: 27 y/o Dizzy

**HPI**
- Mild headache and dizziness progressive for 3 days
- Felt 'off balance'
- No medical problems
- Smokes tobacco, marijuana

**EXAM**
- Stable Vitals
- Strength intact
- Sensation intact
- Finger to nose intact
Case #6A: Dizzy

- 27 year old dizziness/headache for 3 days
- Normal Vitals
- Negative CPSS

Case #6B: 63 y/o Weak and Dizzy

- Feeling dizzy and ‘off balance’
- Difficulty walking for 24 hours
- PMHx: HTN, CAD

How to approach ‘Dizziness’

- 10 Million visits
  - 2.5 Million ED visits
  - High miss rate?
- Central vs. Peripheral
- Diagnostic Testing
- Bedside test:
  - Head-Impulse Test
  - Nystagmus
  - Test of Skew

Stroke or Not?
How good is MRI?

Magnetic resonance imaging and computed tomography in emergency assessment of patients with suspected acute stroke: a prospective comparison

- Sensitivity 83% (77-88%)
- False Negatives:
  - Brainstem location (OR 7.3; 2.2-25)
  - NIHSS < 4 (OR 3.2; 1.3-7.9)
  - Both – Missed 48% (15/31 cases)

Lancet 2007; 369: 293-98

What is (and is not) Helpful

**Helpful**

- Multiple prodrome
- HA/Neck pain (LR 3.2)
- Any neurological signs
- HIT (+LR 18.4, -LR 0.16)
- Gaze evoked nystagmus (Spec 92%)
- Test of Skew (spec 98%)
- MRI (Sens 83%)

**Not Helpful**

- Types of Dizziness
- Onset
- Provocative head mvmt
- Hearing loss
- Severity of symptoms
- Patterns of nystagmus
- Head CT (Sens 16%)

CMAJ 2011, 183(9) E571-E592

HINTS Exam

<table>
<thead>
<tr>
<th>Peripheral</th>
<th>Central</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Impulse Test</td>
<td>Abnormal</td>
</tr>
<tr>
<td>Nystagmus on eccentric gaze*</td>
<td>No Change</td>
</tr>
<tr>
<td>Test of Skew</td>
<td>No</td>
</tr>
</tbody>
</table>

Sensitivity: 100%
Specificity: 96%

*Change = Right gaze, left nystagmus (vice versa for left)

Stroke. 2009;40:3504-3510
Approach to Evaluation

- History…
- History…
- History…
- Exam
- Diagnostics

- When in doubt, assume the worst….

History and Physical Clues

- Fever
- Trauma
- Recurrent Seizures
- Weakness with atrophy
- Recurrent Headaches
- Effort Dependent
- Global symptoms