To Join:

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- For all future texts, you text your choice A-E
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Disclosures:

- On speakers bureau Genentech
Stroke Mimics
OBJECTIVES

• Discuss & learn the pathologies behind various stroke mimics
• Distinguish stroke mimic vs ‘chameleon’
• Objective & subjective methods to distinguish a mimic from a stroke
• Discuss medical & financial ramifications of mimics
Stroke is an Emergency!

- 795,000/year
You wake up in the morning, look in the mirror...
Know the signs of a stroke! **BE FAST**

- Balance
- Eyes
- Face
- Arm
- Speech
- Terrible Headache

Time to call 9-1-1

Wisconsin Coverdell Stroke Program

Aurora BayCare Medical Center
Rapid Stroke Activation
Target Stroke Best Practices

Initial Patient Evaluation → 10 min
Stroke Team Available → 15 min
CT Scan & Lab initiated → 25 min
CT Scan & Lab eval → 45 min
Evaluate t-PA inclusion/exclusion criteria
Administer t-PA → DTN goal ≤ 60 min
*Target Stroke Elite  DTN <45 min
Pt transferred to inpatient setting → <3 hrs
(what if we are wrong?)
Case

- 37 yo F pmh obesity, anxiety & depression here with numbness to her R hand/arm, with inability to move hand in addition to difficulty getting her words out. All symptoms began suddenly around 7:30am. Symptoms lasted 10 minutes then are now resolving - after numbness improved, her speech slowly returned. She also had some visual symptoms. Denies fevers, chills. No h/o cardiac issues. Denies abdominal pain, nausea, vomiting or diarrhea. No recent head injuries.
Stroke Mimics - a lot to consider…

• Rate ranges from 9-31% of CVAs
  • 60% of TIAs
• Approx 8-17% admissions Hyper-Acute Stroke Unit
• Several Mimics
  • difficult to distinguish during Code Stroke!
• $$$Cost$$$ 
  • unnecessary use of healthcare $$, resources, practitioners
• OMG! I tPA’d that migraine!!!

Allder et al 1999, Dawson 2016
SEIZURE ~20-40%

- One of most common stroke mimic in ED pts
  - tend to present in POST-ICTAL phase
- + symptoms
  - motor changes
  - paresthesias
- neg symptoms ~40% occurrence
  - postictal aphasia
  - paresis
- Tend to occur MORE after PARTIAL SEIZURES
- HOWEVER: seizures HAVE occurred in CVA
- 40% after ischemic stroke, 57% after ICH

Gallmetzer et al. 2004, Bladin et al 2000
Conversion Disorder 0-47%

- ‘They know not what they do…’
- Often have documented psychiatric Hx
  - depression
  - fibromyalgia

Lewandowski et al 2015
Glycemic Abnormalities

- **Hypoglycemic** ~ 32mg/dL
  - seizure
  - hemiplegia ~2% (R >> L...don’t know why)

- **Hyperglycemia** - DKA, **HHS**
  - theory: *caused by cellular hyperosmolarity*
  - homonymous hemianopsia
  - hemiplegia
  - hemisensory deficits
  - aphasia
  - hemichorea-hemiballismus

- **Corrects w Glucose correction**
Toxic Ingestions

- Can cause:
  - sedation
  - altered behaviors
- 1 reason ECG is key in CVA work up
- Alcohol intoxication known to cause lateralizing sx
- Salicylate OD (chronic)
  - → confusion
Other Metabolic Abnormalities

- Hyper, Hyponatremia
- Hepatic encephalopathy
  - hemiparesis, hemiplegia
  - seen in ~ 17.4% liver patients

Combined
Toxic + Metabolic ~ 38.0%

Cadranel et al 2001
Sepsis ~6-20%

• Causes
  • Encephalopathy
    • delirium → coma
  • Anamnestic reaction
    • person w prior stroke history weakened by infection
Migraine ~10-19.6%

- ~25% patients have focal neuro deficits
  - Theory: due to *cortical spreading depression*
    - aka: excitation of neurons leads to inhibition
- Hemiplegic migraine
  - aura accompanied by motor weakness
- Other Sx
  - dysarthria, focal weakness, vertigo, ataxia, AMS
- a small # pts have permanent neuro changes 😞
- BUT: 30% stroke patients may have headache at CVA onset!! 😱
Syncopal Episode ~ 13% mimics

- Can be 1st sign of subarachnoid hemorrhage
- Often confused with vestibulobasilar artery strokes
  - → AMS
Neoplasm ~2.8%

- 12% diagnosed CVA’s @ presentation → tumors
- Most Common Presenting Sx
  - vision changes
  - aphasia
  - pure motor hemiparesis
- Tend to be Gliomas
  - also NS lymphoma
  - Anaplastic astrocytoma
Degenerative Neurologic Disorders

- **Multiple Sclerosis**
  - brief paroxysmal sx
    - dysarthria
    - ataxia
    - diplopia, optic neuritis
      - VF deficit
    - sensory deficits
- **Leukoencephalopathy** ($5 word) due to viruses
  - ADEM (acute demyelination encephalomyelitis)
    - post-viral, immune-mediated process
    - shorter onset sx than MS
    - pediatric population
Bell’s Palsy

- A peripheral neurologic issue - NOT Central
- Estimated 20/100,000 annually
- Symptoms:
  - Unilateral facial weakness:
    - Ptosis
    - Facial droop
    - Slurred speech
- Exact cause unknown
  - Infectious causes
    - HSV-1 reactivation
Bell’s Palsy
Bell’s Palsy

- Tends to occur > age 40
  - but...
- So, if there’s no frontal sparing = woot! Bell’s?! …not necessarily
- Some Brain stem strokes have isolated eye w facial weakness
  - Rapidity of onset
  - Age/Risk factors

From: Janjua HS, Ayoob R, Spencer JD
Degenerative Neurologic Disorders

- **Myelopathy**
  - affects spinal cord
  - → motor/sensory loss
- **causes:**
  - inflammation
  - infections
  - trauma
  - vascular lesions
  - compressive lesions
Degenerative Neurologic Disorders

- **Myelopathy**
  - affects spinal cord
  - → motor/sensory loss
  - causes: inflammation, infections, trauma, vascular lesions, compressive lesions

- **Vasculitis**
  - rare
  - often *CAUSES CVA*
Stroke Chameleon?

• A **CVA** that *presents* as a **different** condition...
  • Acute Hemiballismus?
    https://www.youtube.com/watch?v=fCL7RWaC3RA
    • = subthalamic nucleus CVA
  • Confusion, agitation, & delirium?
    • temporal lobe, limbic cortex lesions

• How to tell the difference?
  • if **ACUTE** in onset - **work it up**!

Fernandes et al 2013
Predictors Stroke vs Mimic
Stroke Predictors

1. Strongest predictor: lateralizing weakness
   - PPV 90%
   - NPV 43%

2. Atrial Fib History
3. Hypertension
4. Focal Deficits
5. Age > 50

Ali et al 2018
Mimic Predictors

1. Younger, female
2. ↓NIHSS
   - median 5, range 1-15
3. Epilepsy Hx
4. Migraine Hx
5. Paresthesias
6. Sx INCONSISTENT w vascular territory
7. **NO** Vascular risk factors - HTN, hyperlipidemia, etc
8. Decreased Mental status @ presentation

Hand 2006, Chang 2012
In-hospital Risk Factors

- **A fib**
  - in-patients ↑ likelihood A Fib-related CVA vs outpatient
  - 31% of CVA pts **SUBTHERAPEUTIC** on anticoag
  - 6.9% had anti-thrombotics d/c’d for surg procedures
  - Make sure to restart **α-coags early**
- **Stroke Alerts for AMS = MIMIC >>> CVA**
  - ~ metabolic vs infectious cause

Vera et al 2011
Imaging to help w diagnosis?

- **CT head**
  - *LEAST* sensitive test
  - ~12-52%

- **CTA?**
  - can visualize vascular obstructions
  - increases Sn 70%, Sp~88%

- **MRI?** of course
  - BUT *Sn >80%, Sp 95%*
  - ~1/3 non-disabling CVA had neg DWI 4 days post event

- **4-29% miss rate of CVA**

Nguyen 2015, Makin 2015
What IF we tPA a Mimic?!?!?

- ~1-20% mimics treated with IV tPA
- Harm?
  - hemorrhagic conversion rate: ~1.8 - 5%
    - 5% study - n=2, 1 was 8d post cath w femoral bleed
    - most studies report none
  - Typically seizure or tumor
    - per Lewandowski et al.
- Chernyshev, Chen recommend tPA w ANY patient suspected of Acute CVA w/in 3 hours of onset
  - ...regardless if later we determine it was a mimic...

Lewandowski 2015, Zinkstok 2013, Tsivgoulis 2011
Chernyshev et al 2010. Chen 2011
Cost of Mimics

- 74 pts diagnosed w Mimics 2009-2013
- Median cost per admission: $5401
  - CT head, basic labs
  - tPA
  - ICU observation stay >24hrs
- Median LOS: 1 day
- Direct Hospital Cost $288,277
  (=meds, food, consults, tx, devices, supplies)
- Indirect Hospital Cost: $257,975
  (utilities, facilities, labor)
- Extrapolate to USA: $15,000,000/year

Goyal et al 2015
So...how do we tell?

1. TIMING!!
   ➡ If *acute* onset - consider stroke until proven otherwise

2. Risk Factors
   • some suggest mimic
   • some suggest CVA

3. Neuroanatomy
   - more likely stroke if it occurs in particular vascular distribution
   - Work to understand it
There is NO

- 15% stroke patients had NO LATERALIZING SYMPTOMS
- 6% Sx NOT in Vascular territory
- NIHSS?
  - NIH>10 occurred in 19% mimics

Hand et al 2006
Now Back to Our Case…

- 37 yo F pmh depression, anxiety here with 10 minutes of numbness to her R hand/arm, with inability to move hand in addition to difficulty getting her words out. Visual symptoms described as a ‘flashing zig zag’ when looking to the right. Shortly after resolution of hand numbness, a headache began. Does have hx of rare migraines.

What symptoms push away from CVA and towards a mimic?
37 yo F with pmh depression, anxiety here with 10 min of numbness to her R hand/arm, with inability to move hand in addition to difficulty getting her words out. Visual symptoms described as a ‘flashing zig zag’ when looking to the right. Shortly after resolution of hand numbness, a headache began. Does have hx of rare migraines.

- DDX? Complex migraine, IC hemorrhage, IC Mass, CVA
- Seen by neurology in house
- Negative CT head/CTA
- Likely migraine → NOT tPA candidate
- D/c home
Recap:

Mimics are a reality we can’t escape

• Look at the entire clinical context
  • Risk factors: ?a fib??
  • age
  • prior dx
  • epilepsy/psych hx

• It does cost the system
  ~$5400/mimic
  • BUT if real CVA benefit outweighs cost

• When in doubt, tPA if you are in the window
  • 23 yo (Dr. Cady)
Thank you! Questions?

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References

References