



**KANSAS INITIATIVE FOR  
STROKE SURVIVAL**  
A PROJECT BY AND FOR KANSANS

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Seizures vs Stroke in the Acute Setting

“First Tuesdays” Lecture Series

# Introduction and Goal of “First Tuesdays”

- Sabreena Slavin MD – Vascular Neurologist and Neurohospitalist at KU School of Medicine
- Didactic lecture series as part of the Kansas Initiative for Stroke Survival
- Updates in Practice and FAQ’s on Acute Stroke Care
- 30 minutes for didactics and questions/discussion.

# Outline

- Seizure alone vs Stroke/TIA alone vs Seizure + Stroke?
- How to differentiate
  - MRI
  - CTP
  - EEG
- How to treat

# Stroke mimic examples

- Peripheral vestibular syndromes (acute labyrinthitis, BPPV, etc.)
- Encephalopathy due to toxic or metabolic causes
- Conversion disorder/psychogenic
- Complicated migraines with neurological deficits
- Recrudescence of previous stroke
- **Seizures with postictal hemiplegia (Todd's paralysis)**

# Seizures can be a stroke mimic

- Seizures account for 20% of all suspected strokes and is the most common cause of stroke mimics in ED
- Often if seizure is unwitnessed, no convulsions are reported
- Postictal loss of function has been reported in 13.4% of patients after seizures during EEG monitoring in one study, more often in structural epilepsy
- Mean duration of deficits in one study was 15 hours, ranging from 30 min-36 hours
- Deficits can include:
  - Weakness
  - Aphasia
  - Neglect
  - Gaze palsy

# Pathophysiology of postictal phenomenon

- “Neuronal exhaustion”: seizures causes dysfunction of neurons via anoxia or due to increased lactic acid levels
- “Active inhibition”: seizures activate inhibitory neurons in the cortex
- No association between the location of seizure and duration of the postictal deficit
- Postictal weakness is most commonly seen and has longer duration after seizures with unilateral clonic activity
- Dystonic posturing may also be seen with postictal weakness



# Seizures after chronic stroke

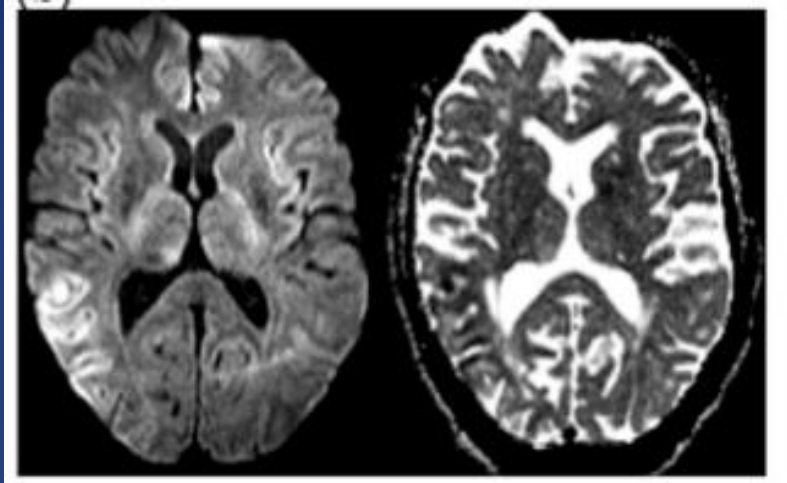
- After patient has already had a stroke, it may be confusing to differentiate seizures from new stroke or TIA
- 25% of seizures post stroke are “negative seizures” with no clonic activity but instead a neurological deficit
- Occurs most commonly with cortical strokes, especially parietal or temporal lobes

# But, is it seizures plus acute stroke?

- Seizures can occur in patients with chronic stroke but may also occur within the first few hours of acute stroke
- Can occur acutely in up to 6% of ischemic and 15% of hemorrhagic stroke
- Need to differentiate in ED immediately due to decision on treating with only seizure medications vs tPA/reperfusion therapy



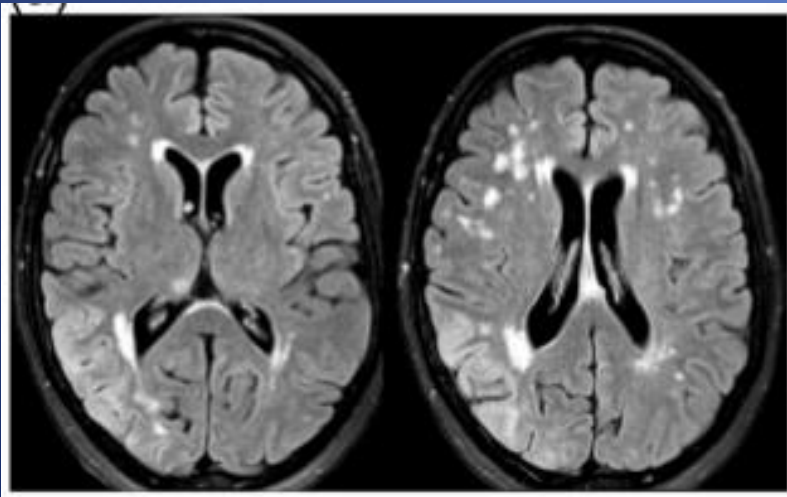
# MRI findings



DWI

ADC

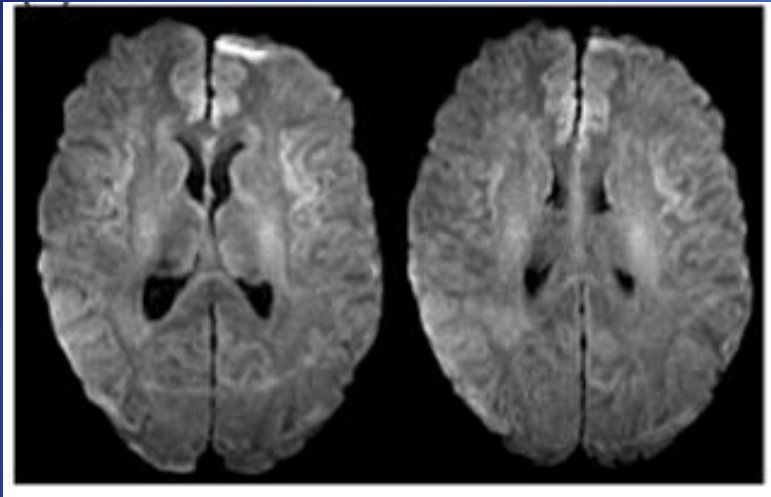
- 64 yo F with L visual field cut and visual/tactile neglect on exam



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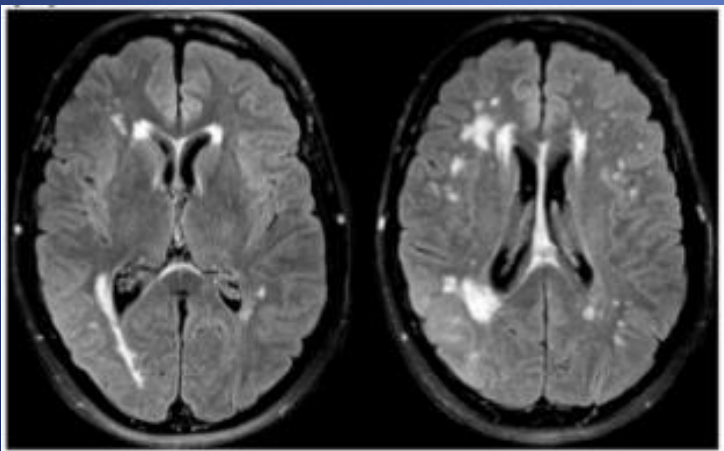
# MRI findings



DWI

ADC

- 64 yo F with L visual field cut and visual/tactile neglect on exam.
- Imaging days later



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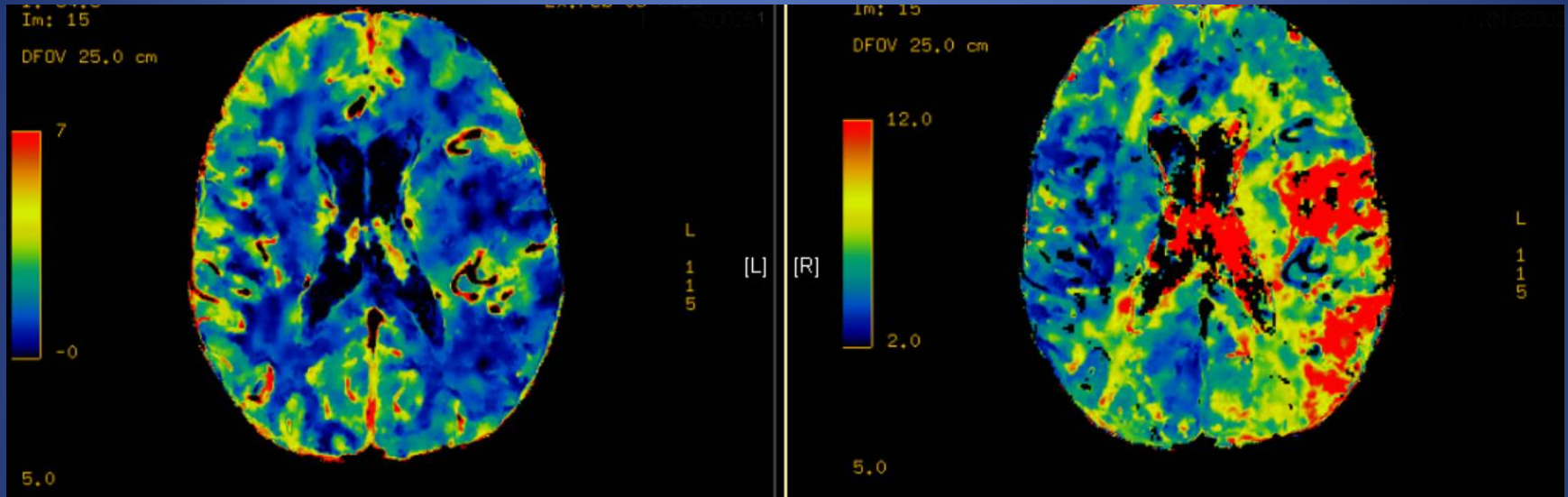
# MRI in seizures

- Transient peri-ictal MRI abnormalities (TPMA):  
Reversible brain lesions not following a vascular distribution
- Can be DWI positive and T2 hyperintense
- T2 hyperintensity occurs earlier than expected typically with acute stroke (within few hours)
- Affects epileptogenic focus and surrounding tissue

# CT perfusion can differentiate

- CTP uses measures of core (area irreversibly damaged) and measures of penumbra (area at risk, reversible) to determine whether intervention would benefit in acute stroke.
- Can also be used to diagnose potential stroke from stroke mimic such as seizure
- Measures of core should be decreased (darker): CBV, CBF
- Measures of penumbra should be increased (brighter): MTT, TTP, Tmax

# CTP in acute stroke

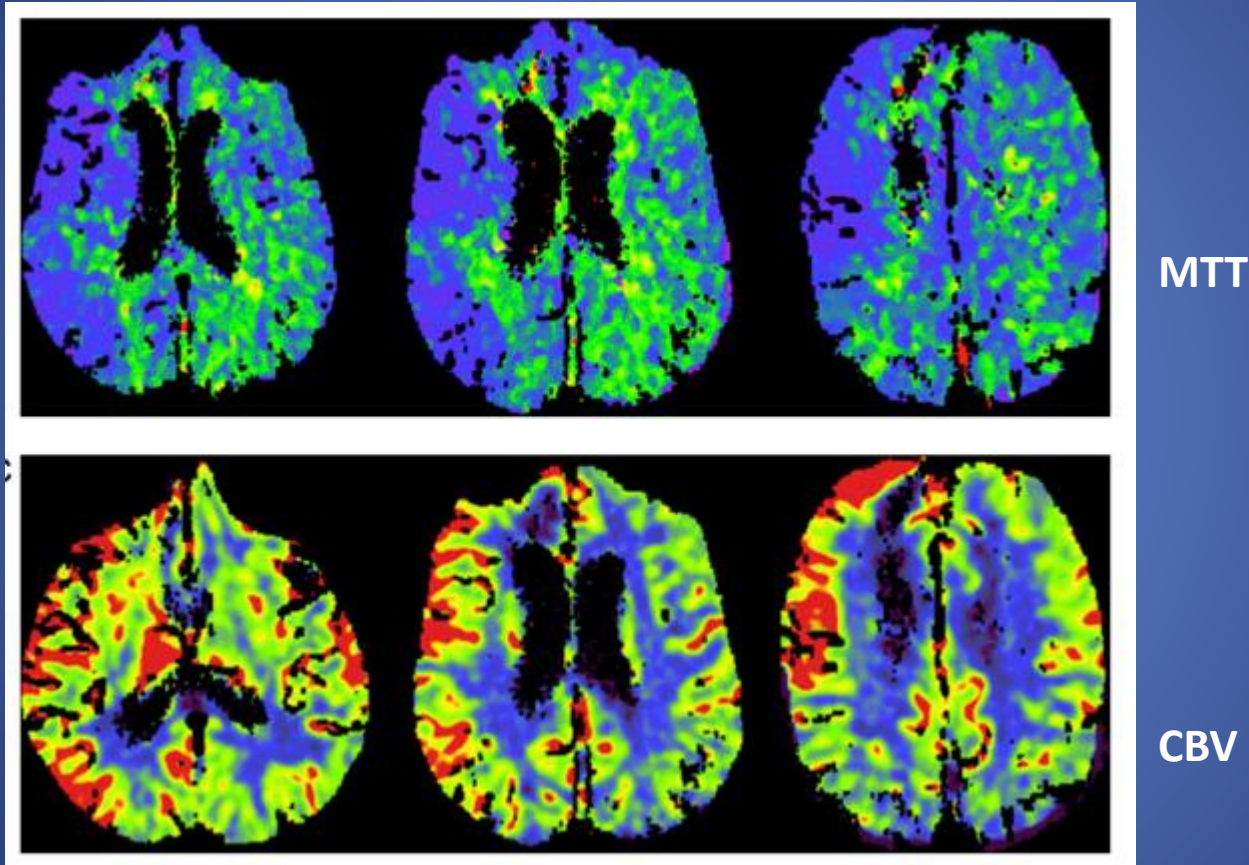


CBV

Tmax

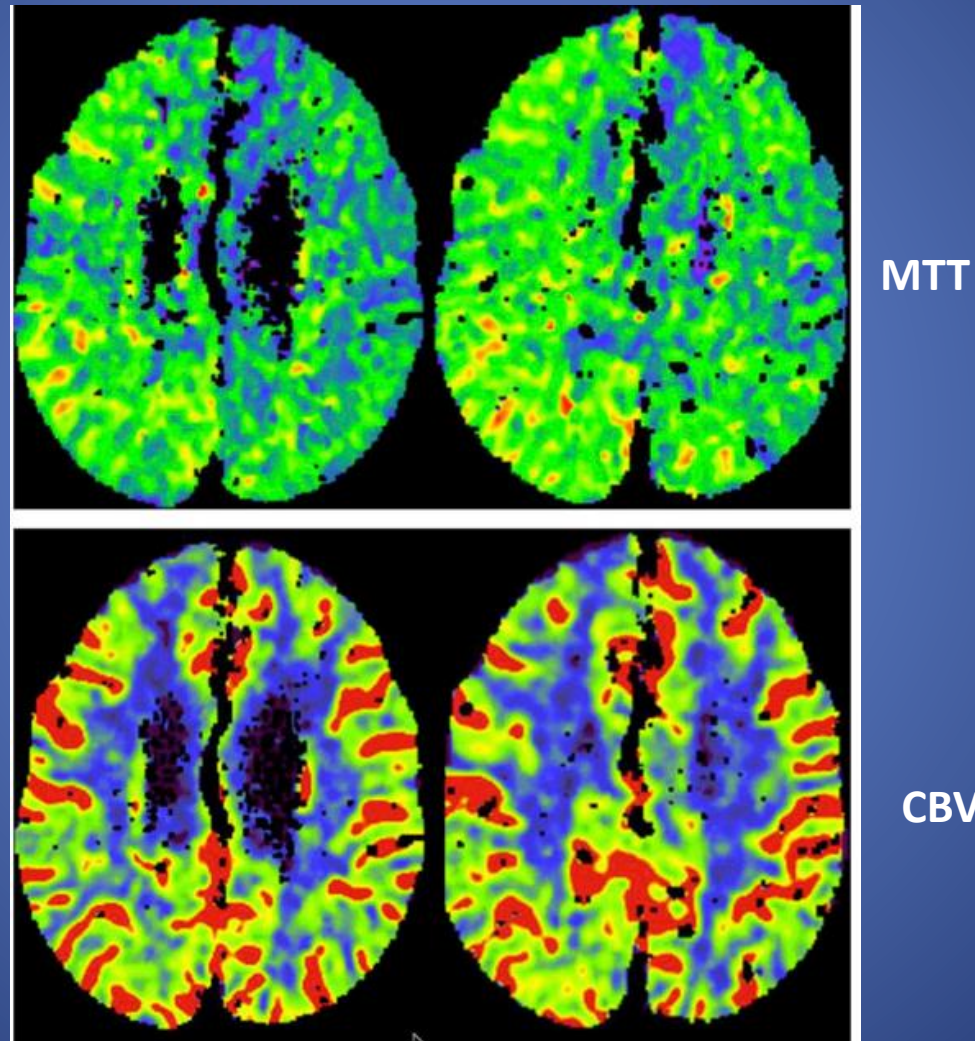


# CTP in seizure/nonstroke





# CTP in seizure/nonstroke



# EEG

- In setting of known chronic stroke and new deficit, video EEG is helpful to differentiate between TIA and seizure
- EEG is less helpful in the acute setting to differentiate between seizure alone vs seizure + acute stroke because has it low specificity in diagnosing stroke
- EEG findings can include epileptiform discharges, lateralized periodic discharges, or rhythmic slowing

# Seizures causing impairment of consciousness

- Poststroke nonconvulsive seizures or status epilepticus in first few days can occur in 3-4% of ischemic strokes and 8-9% of hemorrhagic strokes
- May be hard to differentiate between stroke affecting consciousness (thalamic/brainstem/parietal involvement) or toxic metabolic process.
- Consider continuous EEG at least 24 hours in this setting

**Table 1**

Characteristics of postictal negative symptoms and poststroke neurological deficits in seizures at stroke onset.

	Postictal negative symptoms	Poststroke neurological deficits	Comments
Clinical history	There may be a history of epilepsy Postictal negative symptoms may occur also at the very first occurrence of any epileptic seizure The diagnosis is more readily apparent if patients have recurrent focal motor seizures	Usually there is no history of epilepsy	The clinical history is usually not decisive in the differential diagnosis
Duration of symptoms	Postictal deficits are brief after focal seizures (median duration: 3 min; range 11 s–22 min) Postictal negative symptoms last longer after tonic-clonic seizures (median duration: 6 min; range: 2.7 min–20 min) Postictal deficits last longer in persisting nonconvulsive seizures		Suspect poststroke neurological deficits if the focal negative phenomena persist beyond more than a few minutes, particularly after focal seizures
Electroencephalogram	Focal or more widespread slowing; focal epileptiform abnormalities; ictal pattern (if persisting nonconvulsive seizure)	Focal slowing corresponding to the site of the lesion; epileptiform abnormalities; no ictal pattern	The EEG has limited utility in the differential diagnosis
Neuroimaging	MRI with DWI and apparent diffusion coefficient: negative or transient changes (usually slight abnormalities without a clear vascular distribution); leptomeningeal enhancement following contrast administration CT-Angiography: usually unremarkable (no evidence of large vessel occlusion)	MRI with DWI and apparent diffusion coefficient indicative of ischemic stroke (prominent abnormalities following a vascular distribution); no leptomeningeal enhancement following contrast administration CT-Angiography: can reveal large vessel occlusion Perfusion-CT: reduced cerebral blood flow in a specific vascular territory	Neuroimaging investigations can reliably differentiate between the two conditions
Management	General seizure management (starting AEDs or increase their dose) Thrombolysis is unnecessary and contraindicated	Thrombolysis should be performed	
Prognosis	Postictal symptoms recover spontaneously over time	Variable; depend on the diagnostic delay and the efficacy of reperfusion therapies	



# IV tPA administration with seizures

- Witnessed seizure at stroke onset is a **relative** contraindication to tPA per AHA guidelines
- However, seizures can occur at onset of acute stroke and history per witnesses may be misleading (convulsive syncope vs posturing vs actual seizure)
- Over 300 patients with seizure at onset given tPA in the literature, of which symptomatic ICH only reported in two patients, one of whom also had a remote brain tumor
- 91% of stroke neurologists in one survey would recommend tPA in patients with seizures at symptom onset.

# IV tPA in stroke mimics

- In patients who were given IV tPA after cardiac MI, there was a rate of ICH in 0.72%<sup>1</sup>
- Stroke studies have found similar rates of ICH after tPA in patients who were not having acute stroke – in a meta-analysis of 9 studies which included **392 patients with stroke mimics, symptomatic ICH occurred in 0.5%**<sup>2</sup>



# Bottom line

- When question of seizure plus neurological deficits, obtain stat CTP in ED in addition to usual imaging. Stat MRI may also be helpful but may be confusing if DWI positive.
- Ok to treat cases suspecting seizure with antiseizure medications: may jump straight to Keppra/Depakote/Dilantin instead of Ativan if worried about mental status
- Ok to treat cases with tPA if neurological deficits despite seizures

# Questions?

- Call for help anytime!
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