



# TBI-BH ECHO

Traumatic Brain Injury - Behavioral Health ECHO  
UW Medicine | Psychiatry and Behavioral Sciences

## Seizures & TBI

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TBI-BH ECHO

# Speaker disclosures

✓ No conflicts of interest

The following series planners have no conflicts of interest:

- ✓ Jennifer Erickson DO
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# Objectives

1. List 3 risk factors for post-traumatic seizures
2. Describe 1-3 steps to take in the assessment of post-traumatic seizures
3. List two important considerations when choosing an anticonvulsant



What is a seizure?

How do you tell if someone has had/is having a seizure?



# Seizures

- ▶ Seizure: an abnormal electrical event in the brain



# What is Epilepsy?



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# Epilepsy

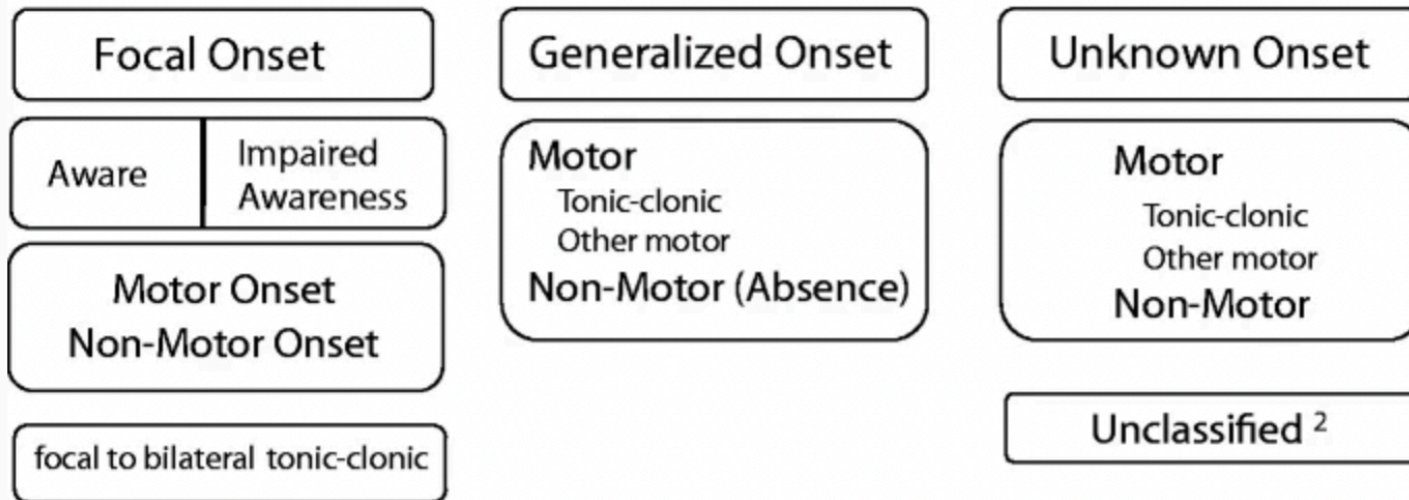
- ▶ Epilepsy: 2 unprovoked seizures more than 24 hrs apart



# Types of Seizures

[The New Classification of Seizures by the International League Against Epilepsy 2017](#)

## a ILAE 2017 Classification of Seizure Types Basic Version <sup>1</sup>



<sup>1</sup> Definitions, other seizure types and descriptors are listed in the accompanying paper & glossary of terms

<sup>2</sup> Due to inadequate information or inability to place in other categories





# Nonepileptic Seizures (PNES/NES)

- ▶ Episode behavioral events without evidence of associated electrical activity
- ▶ Not well studied in TBI
- ▶ The overlap between PNES and Epilepsy is significant
- ▶ Study by Hudak et al. found a 1/3 of patients who were undergoing video EEG and had had a moderate to severe TBI presented with PNES.



# TBI & Seizures

- ▶ TBI is one of the most important causes of epilepsy
- ▶ 20% of structural epilepsy is observed in patients with TBI in comparison to 5% of the general population
- ▶ TBI is the leading cause of epilepsy in adults
- ▶ 1/2-2/3 will experience seizure onset with 1 year and 3/4+ by 2 years
- ▶ The most common type is focal, simple
- ▶ EEG is the essential tool



# Risk Factors for Seizures after TBI

- ▶ Non-penetrating
  - ▶ 4% - 7%
- ▶ Penetrating
  - ▶ 35% - 65%
- ▶ Other Risk factors
  - ▶ Dural tear
  - ▶ Foreign body
  - ▶ Focal neurologic findings
  - ▶ Age
  - ▶ Alcohol abuse

Intracranial hematoma: ~ 30%

Early Post Traumatic Seizure: ~ 25%

Depressed Skull factor: 3-70%

Prolonged Coma or PTA: 35%



# Location, location, location

Site of Origin	Manifestations
Frontal	Short seizures, impaired awareness, complex automatism, multiple times a day and during sleep
Cingulate	Automatic signs, changes in mood, emotional auras (fear/ anger)
Orbitalfrontal	Odd, complex motor behaviors, olfactory hallucination, automatic signs
Dorsolateral	Tonic clonic neck, eyes, head, speech arrest, “psuedoabsence seizures”
Motor Cortex	Focal motor on side & topography affected. Generalizes & can march along the motor strip to additional areas
Supplementary motor cortex	Postural, speech arrest, fencing postures.
Temporal lobes	Autonomic, psychiatric symptoms, smell or auditory hallucination



# Case

- ▶ You reviewed the documentation for a 23 y/o male who suffered a severe brain injury during a skateboarding accident and had an event that was suggestive of a seizure while EMS was en route. During his initial hospitalization, he had a second seizure two weeks after his injury. Which of the following pairs is the description for the timing of his seizures?
  - ▶ A. Immediate/Early
  - ▶ B. Early/Late
  - ▶ C. Immediate/Late
  - ▶ D. I am guessing anyway, and like the letter D



# Time of seizures

- ▶ Immediate < 24 hrs after injury
- ▶ Early > 24 hrs - 7 days
- ▶ Late > 7 days
  - ▶ Late most concerning & presence at highest risk of PTE
- ▶ Prophylactic use of an AED is common in TBI centers, and often, that medication is discontinued after 1 week



# Post-traumatic Epilepsy

- ▶ Characterized by recurrent late seizure episodes not attributable to another apparent cause
- ▶ The risk of recurrence of PTS is high
- ▶ No standard treatment. It needs to be tailored to the individual.
- ▶ If symptoms are free for two years, a supervised taper is warranted
- ▶ PNES are common in patients with TBI as they are in the general seizure population
- ▶ Prolong EEG may be needed for diagnosis



# Why assess & treat (if able)?

- ▶ Seizure recurrence is an critical factor in QOL and disability
- ▶ Impact mortality
- ▶ Disinhibited behaviors, irritability, and aggression maybe higher than general population (Mazzini et al)
- ▶ Impacts cognition and increased brain volume loss seen (Vietnam Brain Injury study)





# Behavioral manifestations

- ▶ Varies based on origin of electrical abnormalities
- ▶ A schizophrenia-like presentation can be present with lesions in the temporal limbic cortex
- ▶ Timing matters
  - ▶ Before (aura) - treat by preventing seizures
  - ▶ During (intraictal) - treat by preventing seizures
  - ▶ Between episode & persistent (postictal) - may require an antipsychotic



# Assessment

- ▶ Good history
- ▶ Good Neuro-exam
- ▶ Seizure log
- ▶ EEG is essential- VEEG> Ambulatory EEG> spot EEG
- ▶ Biomarkers have evolving evidence
  - ▶ Prolactin - within 1 hour. Inaccurate results are possible
  - ▶ IL-1
  - ▶ SLC1A1



# Treatment

- ▶ Much of the literature is still based on the whole population treated for epilepsy
- ▶ Balance risk of relapse with medication SE
- ▶ Up to 30% of patients may need a medication discontinued or changed due to an SE.(12)
- ▶ The goal is seizure prevention or minimization of frequency
- ▶ Start 1 agent and titrate; change to a different one if SE occurs
- ▶ Add a 2nd agent and titrate
- ▶ Refer for surgery evaluation
  - ▶ Excision
  - ▶ DBS
  - ▶ VNS
  - ▶ RNS



# Medication

- ▶ Carbamazepine\*
- ▶ Phenytoin
- ▶ Valproate\*
- ▶ Felbmate
- ▶ Lamotrigine\*
- ▶ Oxcarbazepine\*
- ▶ Tiagabine
- ▶ Levetiracetam
- ▶ Zonisamide
- ▶ Topiramate\*
- ▶ Gabapentin\*
- ▶ Lacosamide
- ▶ Vigabatrin
- ▶ Pregabalin\*
- ▶ Cenobarnate
- ▶ Brivaracetam
- ▶ Clobazam
- ▶ Clonazepam\*
- ▶ Eslicarbazapine
- ▶ Fosphenytoin
- ▶ Perampnenel
- ▶ Diazepam\*
- ▶ Lorazepam\*



# Ketogenic diet

- ▶ Established for refractory seizures in children
- ▶ NO literature/studies on humans with PTE



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