Initial Presentation of Epilepsy

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Objectives

- Recognize symptoms suggestive of seizure and what those clinical symptoms represent
- Understand classification of epilepsy and why this is important
- Identify the appropriate evaluation and initial treatment options for individuals with epilepsy
Definitions:

• Seizure: Transient neurological dysfunction resulting from an excessive abnormal electrical discharge of cortical neurons
• Seizures represent a “hyperexcited” state
  • The neurons release neurotransmitters
  • Imbalance of excitatory and inhibitory chemicals results in an excited state

• Firing results in clinically stereotyped events
  • Sensory, motor, behavioral, visual
  • Abnormalities can be recorded on EEG, with or without clinical symptoms
Definitions

- Epilepsy
  - Recurrent, unprovoked seizures
  - A heightened tendency toward recurrent unprovoked seizures
  - A diagnosis of an epilepsy syndrome

Epilepsy

- Lifetime incidence of seizure of any cause – up to 10%.
- Epilepsy affects about 3 million Americans and an estimated 50 million worldwide
  - Incidence of epilepsy in US – 1.4 – 3.3%.
- Distribution for age of onset is bimodal.
- Third most common neurologic diagnosis in older adults (behind dementia and stroke)
Seizures

- Seizures and epilepsy may arise due to many different reasons
  - Genetic or developmental reasons*
  - Fever
  - Stroke or vascular anomaly
  - Tumor
  - Head trauma*
  - History of brain infection*
  - Idiopathic

*Significant increase in risk for epilepsy

Stroke
Vascular Malformation

Presentation with a First Seizure

- Was it provoked?
- Is it an acute symptomatic seizure?
- Is it a remote symptomatic seizure?
- Could the seizure be associated with epilepsy syndrome?
- Unknown?
Episodic Disorders and Mimics

- Syncope
- TIA/Stroke
- Migraine
- Non-epileptic behavioral spells (psychogenic nonepileptic event)
- Toxic/metabolic
- Sleep disorders
- Infection
- Transient global amnesia

More Mimics...

- Delerium
- Other Psychogenic (panic, anxiety or rage attacks)
- Vertigo
- Orthostasis
- Tremor
- Myoclonus or other movement disorders (tic disorder)
- Sleep disorder
- Vertebrobasilar insufficiency
- Alcohol withdrawal
- Dementia
Classification of epilepsy

Revised by the International League Against Epilepsy in 2010

- Mode of Onset
  - Generalized:
    - Seizures that originate in or rapidly engage neural networks in both hemispheres
  - Focal:
    - Seizures that originate in the neural network of one hemisphere

Classification of epilepsy

- Epilepsy syndrome
  - Clinically distinctive disorders on the basis of specific seizure type, underlying pathology and predicts prognosis
Classification of epilepsy

- Generalized:
  - Seizures that originate in or rapidly engage neural networks in both hemispheres
- Types:
  - Absence
  - Tonic-clonic
  - Myoclonic
  - Clonic
  - Tonic
  - Atonic

Absence

Absence seizure –
Childhood absence epilepsy is a distinct syndrome
- Age of onset: 4-10 years
- Sudden cessation of activity, with blank stare
- Altered consciousness
- May have automatisms
- Lasts 4-20 seconds – usually 10 seconds
- Occurs multiple times per day
- Precipitated by hyperventilation
- Classic EEG: 3 Hz Spike and Wave
Generalized tonic-clonic

Generalized tonic-clonic seizure
May have sense of fatigue, irritability before the seizure, but no aura
- Generalized (whole brain) seizure onset.
- Initial rigid (tonic) posture followed by jerking of limbs (clonic activity).
- Typically lasts 1-2 minutes
- Loss of consciousness
- Followed by lethargy, typically 20-30 minutes

Myoclonic

- Myoclonic seizures
  - Preserved consciousness
  - Brief, abrupt, jerks of the limbs which can be unilateral, bilateral and multifocal
  - May be repetitive or occur in isolation.
  - May be sign of underlying medical problem (metabolic derangements)
Classification of seizures

- Focal:
  - Seizures that originate in the neural network of one hemisphere
- Types
  - Without impairment in consciousness
    - Previously simple partial
  - With impairment in consciousness
    - Previously complex partial
    - Evolving to bilateral, convulsive seizure

Focal seizures

- Frontal lobe seizures:
  - Significantly shorter in duration than seizures originating in the temporal lobes
  - Nighttime preponderance
  - No typical aura
  - Alteration in awareness implies spread to the ipsilateral temporal lobes
Focal seizures

- Frontal lobe seizures
  - Focal clonic seizures –
    - Involve motor strip, though may not originate there
    - Contralateral clonic movements of the limbs, face, trunk
  - Asymmetric tonic seizures –
    - Supplementary motor area
    - Tonic posturing is usually asymmetric
  - Hyperkinetic seizures
    - Various parts of the frontal lobe
    - Complex behaviors (bicycling, running) – typically with vocalization

- Mesial temporal lobe seizure
  - Often preceded by an aura (start of the seizure)
    - Usually a visceral sensation: nausea, gastric uprising
    - Other less common aura:
      - Fear, olfactory/gustatory hallucinations, distortions of memory (déjà vu)
  - Motionless stare, lasting 1-2 minutes
• Automatisms –
  • Lip smacking, chewing, or swallowing
  • Gestural – ipsilateral to side of seizure onset
• Dystonic posturing contralateral to the side of seizure onset
• Head deviation
  • Early - ipsilateral to the seizure focus
  • Late - contralateral

Mesial Temporal Sclerosis
Seizure triggers

- Flickering light or strobe light effect
- Sleep deprivation
- Alcohol or drug use
- Missed medications
- Stress – physical or emotional
- Menstrual cycle
- Rare: music, writing, eating, startle, reading...

Evaluation

- History
- Physical
- Diagnostic Studies:
  - Lab evaluations
  - EEG, video/EEG
  - Neuroimaging
  - Cardiac evaluation
  - Sleep study
Lab evaluations

• Comprehensive metabolic panel
• Magnesium, phosphorus
• Urine drug screen
• LP if signs of infection

Diagnostic Studies: Video/EEG

• Prolonged interictal monitoring, including sleep, allows a better sampling to improve yield.
• Can reduce/withdraw medication to provoke spell.
• Able to watch the clinical spell (video) and correlate with electrographic abnormality
Treatment of Seizure

- In adults, risk of recurrence after first seizure is between 27-60%.
  - Increased risk if EEG is abnormal.
  - Risk after second seizure is 80-90%.

Anti-epileptic Medications

- Designed and geared to favor neuronal inhibition over excitation
  - Sodium and calcium channels
  - Decrease glutamate-aspartate transmission
  - Increase \( \gamma \)-aminobutyric acid (GABA) neurotransmission
Anti-epileptic Medications

- Factors to consider when choosing an anti-epileptic medication:
  - Cost
  - Side effect profile
  - Co-morbid conditions
  - Seizure type

Anti-epileptic medications

- Goal is to use a single drug to control seizure
  - Most will have success after the first medication
  - Once two or more correctly chosen medications fail, chances of seizure freedom are very low
Anti-epileptic medications

- Focal seizures
  - Phenytoin
  - Carbamazepine
  - Oxcarbazepine
  - Gabapentin
  - Pregabalin
  - Phenobarbital
  - Tiagabine
  - Lacosamide
  - Vigabatrin
  - Ezogabine

Anti-epileptic medications

- Generalized
  - Ethosuximide (absence)
Anti-epileptic medications

- Broad spectrum
  - Valproate
  - Lamotrigine
  - Topiramate
  - Levetiracetam
  - Rufinamide
  - Felbamate
  - Zonisamide
  - Benzodiazepines
  - Perampanel

Conclusion

- Epilepsy is a clinical diagnosis
- Diagnosis is aided by:
  - History
  - Diagnostic testing, the most important being the EEG
  - Response to treatment
- Treatment response may be dependent on accurate diagnosis of epilepsy