Seizures and Epilepsy: A practical guide to primary care providers

Bhrugav Raval, M.D.
Assistant Professor
Department of Neurology
The University of Oklahoma Health Sciences Center
I have no relevant financial relationships or affiliations with commercial interests to disclose.
LEARNING OBJECTIVES

- Describe basics of seizures and epilepsy including different types, symptoms, understand underlying etiologies and common alternative diagnoses that mimic seizures
- Describe different treatment options, including medications and neurostimulation devices depending on the seizure type
- Describe role of tertiary level epilepsy center in management of complicated epilepsy patients
Seizure

International League Against Epilepsy (ILAE) defines an epileptic seizure as “a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain”
Epilepsy

“Epilepsy is a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the neurobiologic, cognitive, psychological, and social consequences of this condition.”

The definition of epilepsy requires the occurrence of at least one epileptic seizure.
Epilepsy - Epidemiology

- Affects 50 million people worldwide
  - 80% of these live in low to middle-income countries

- In United States,
  - Prevalence ~ 1%; 3 million cases in US
  - 150,000 new cases every year
  - 1 in 26 people in US will develop epilepsy at some point in their life
Active Epilepsy Prevalence, by State

Estimated Number of People with Active Epilepsy by State and Age Group

Legend

Estimated numbers of active epilepsy cases

- 5900 - 14000
- 14100 - 32800
- 35700 - 56800
- 59600 - 92700
- 108900 - 427700
Approach to first seizure

- Step 1: Ascertain diagnosis of seizure vs non epileptic spells
- Step 2: Determine whether seizure is
  - Acute symptomatic
  - Provoked
  - Unprovoked (risk of epilepsy)
- Step 3: Workup to evaluate for etiology/confirm diagnosis
- Step 4: Treatment
Taking history

- Spell description: Provided by patient as well as witness accounts
  - Presence of premonitory symptoms or “aura”
  - Features suggestive of epileptic seizure
    - Lip smacking, unresponsiveness (temporal lobe seizures)
    - Presence of tonic-clonic activity
    - Presence of tongue bite or bowel/bladder incontinence
    - Presence of post-ictal confusion/speech problems/motor weakness
  - Feature typically not associated with epileptic seizure
    - Premonitory symptoms of lightheadedness, “faint” sensation
    - Quick return to baseline
Taking history

- Past history

- Assessment of risk factors for epilepsy include history of CNS infections, history of major head trauma (penetrating), history of febrile seizures as well as family history of seizure or similar spells.
Physical examination

- General examination
  - Evidence of physical injuries – e.g., shoulder dislocation or vertebral fractures can occur with convulsive seizures
  - Presence of fever

- Neurological examination
  - Presence of focal deficits
  - Persistent altered mental status
<table>
<thead>
<tr>
<th>Acute symptomatic seizure</th>
<th>Provoked seizure</th>
<th>Unprovoked seizure</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Secondary to acute neurological injury</td>
<td>• Similar to acute symptomatic seizure</td>
<td>• No definite trigger noted</td>
</tr>
<tr>
<td>• E.g. penetrating head trauma with intracerebral hemorrhage, herpes encephalitis</td>
<td>• Typically secondary to transient and reversible etiology – e.g. drug ingestion, toxins, metabolic derangements</td>
<td>• Higher chances of recurrence</td>
</tr>
</tbody>
</table>
Acute symptomatic seizure/Provoked seizure

**Etiologies**

- **Acute cerebrovascular events** – Ischemic stroke, subarachnoid hemorrhage, intraparenchymal hemorrhage, cerebral venous sinus thrombosis
- **Traumatic brain injury**
- **CNS Infections** – Herpes Encephalitis, neurocysticercosis
- **Metabolic derangements**
  - Hyponatremia, Hypo/Hyperglycemia, Hypomagnesaemia, Hypocalcemia
- **High Fever “Febrile seizures”**

**Etiologies**

- **Medications** – e.g. certain anti-depressants, anti-psychotics, anti-neoplastic agents, Benzodiazepine/Barbiturate withdrawal
- **Alcohol** – intoxication and withdrawal
- **Illicit drugs** – cocaine, amphetamine-like, LSD, etc.
- **Eclampsia**
- **Anoxic encephalopathy**
Why does it matter?

• Compared mortality and risk of subsequent unprovoked seizures in 2 groups – one with acute symptomatic seizures and other with unprovoked seizure

• Results
  • Patients with acute symptomatic seizure
    • Are 9 times more likely to die in 1st 30 days compared to patients with unprovoked seizure
    • had 80% less chance to develop subsequent unprovoked seizure compared to patients with first unprovoked seizure.
  • Summary – “Acute symptomatic seizures have a higher early mortality and a lower risk for subsequent unprovoked seizure.”
Evaluation of Unprovoked Seizures

OBJECTIVES

- Classification of seizure type based on semiology (description)
- Workup for possible underlying etiology
- Assessment for risk of further seizures
ILAE 2017 Classification of Seizure Types Basic Version

**Focal Onset**
- Aware
- Impaired Awareness
- Motor
- Non-Motor

**Generalized Onset**
- Motor
  - Tonic-clonic
  - Other motor
- Non-Motor (Absence)

**Unknown Onset**
- Motor
  - Tonic-clonic
  - Other motor
- Non-Motor

**Unclassified**

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

2 Due to inadequate information or inability to place in other categories

**Focal Onset**
- Classified to either:
  - Aware
  - Impaired awareness
- Motor Onset
- Non-motor Onset
  - May progress to:
    - Focal to bilateral tonic-clonic

**Generalised Onset**
- Classified to either:
  - Motor
    - Tonic clonic
    - Other motor
  - Non-motor
    (Absence seizures)

**Unknown Onset**
- Classified to either:
  - Motor
    - Tonic clonic
    - Other motor
  - Non-motor
  - Unclassified

Aware = Awareness during the seizure, knowledge of self and environment, consciousness is intact.
Motor = Movement or motion
Unclassified = Seizures with patterns that do not fit into the other categories or there is insufficient information to classify the seizure.
### Region of Onset | Partial/Focal Seizure Characteristics
---|---
Frontal | Focal clonic motor  
| | Hypermotor behavior  
Temporal |  
| Mesial | Autonomic  
| | Dysmnesic  
| | Déjà vu  
| | Jamais vu  
| | Gustatory  
| | Olfactory  
Lateral/posterior neocortical | Auditory  
| | Complex visual  
| | Dysphasia  
Parietal | Somatosensory  
Occipital | Simple visual  

**Frontal lobe**
Movement, emotions, memory, language, social, sexual behaviour, and personality

**Temporal lobe**
Hearing, speech, memory and emotions

**Parietal lobe**
Bodily sensations

**Occipital lobe**
Processing vision

Balance and coordination
Breathing, heart rate and temperature


https://ewct.org.nz/epilepsy-types/
Epilepsy Type

Etiology of Epilepsy

- **Structural**
  - Stroke
  - Tumors
  - Cortical malformations
    - Focal cortical dysplasia
    - Pachygyria
    - Polymicrogyria
  - Traumatic brain injury

- **Infectious**
  - Meningitis
  - Encephalitis – e.g. HSV

- **Metabolic**
  - Glycogen storage disorders

- **Inflammatory**
  - Autoimmune epilepsies
    - e.g. Leucine-rich Glioma Inactivated I
    - NMDA receptor antibodies
    - Voltage-gated Potassium Channel complex antibodies

- **Genetic**
  - Dravet syndrome, autosomal dominant nocturnal frontal lobe epilepsy, genetic generalized epilepsies, etc.
# Epilepsy Syndromes

<table>
<thead>
<tr>
<th>Epilepsy Syndrome</th>
<th>Seizure Types</th>
<th>Age of Onset</th>
<th>Self-limiting (Yes or No)</th>
<th>EEG Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Childhood absence epilepsy</td>
<td>Absence, generalized tonic-clonic (rare)</td>
<td>4 to 10 years</td>
<td>Yes</td>
<td>Normal background, occipital intermittent rhythmic delta activity, 3-3.5 Hz generalized spike-wave discharges</td>
</tr>
<tr>
<td>Juvenile absence epilepsy</td>
<td>Absence, generalized tonic-clonic, myoclonic (rare)</td>
<td>Adolescence to early adulthood</td>
<td>No</td>
<td>Normal background, polyspikes may be present, 3-3.5 Hz generalized spike-wave discharges</td>
</tr>
<tr>
<td>Juvenile myoclonic epilepsy</td>
<td>Myoclonic, generalized tonic-clonic, absence (rare)</td>
<td>10 years to mid-twenties</td>
<td>No</td>
<td>Normal background, 3-3.5 Hz generalized spike-wave discharges, &gt;4 Hz generalized spike-wave discharges, high-amplitude polyspike-wave discharges with myoclonic seizures, photoparoxysmal response in up to 40% of patients</td>
</tr>
<tr>
<td>Epilepsy with generalized tonic-clonic seizures alone</td>
<td>Generalized tonic-clonic</td>
<td>Childhood to mid-adulthood</td>
<td>No</td>
<td>Normal background, generalized spike/polyspike-wave discharges</td>
</tr>
</tbody>
</table>
A 13-year-old girl presented for evaluation after experiencing a single generalized tonic-clonic seizure that occurred in the morning upon awakening. Her history revealed that for the past year, she would often drop her toothbrush in the morning.

Her past medical history and family history were unremarkable. Menarche had occurred at age 12. She took no medications and had no history of alcohol, tobacco, or illicit drug use. Her physical and neurologic examinations were unremarkable. Brain MRI was normal, and EEG revealed generalized spike-wave discharges (FIGURE 1-5). The patient’s parents questioned whether she had epilepsy and whether she should be treated.
Role of Neuroimaging: MRI Brain

Traumatic Brain Injury – Multiple regions of encephalomalacia
A/B – Left frontal cortical dysplasia

White arrow – periventricular nodular heterotopia
Black arrow – cortical dysplasia
Right temporal cavernous hemangioma
MRI Brain without contrast showing left mesial temporal sclerosis in patient with medically refractory seizures characterized by burning sensation in stomach rising into chest, with hand automatisms and loss of awareness.
Right temporal dysembyroplastic neuroepithelial tumor (DNET)
Role of Electroencephalogram (EEG)

- Most commonly performed and one of the most important tool in diagnosis of epilepsy
- Can help confirm the diagnosis of epilepsy, give information about localization of seizures and can help guide treatment including possibility of withdrawal of medication.
EEG in epilepsy

- **Epileptiform discharge**
  - Spike, sharp wave, spike and wave discharge
  - Suggest increased tendency to have seizures
  - Normal EEG does not rule out epilepsy

- **Factors affecting diagnostic yield**
  - Age of patient
  - Type of epilepsy syndrome
  - Proximity of EEG to seizure
  - AED therapy
Video-EEG study

- Indications
  - Evaluation of spells
  - Seizure classification
  - Seizure quantification
  - Assessment of seizure precipitating factors, ands
  - Surgical localization in drug-resistant focal epilepsy.
A 27-year-old man presented after experiencing an episode of loss of awareness. His friend reported that he had been eating dinner when he acutely stared off, which was followed by lip smacking, chewing movements, and clenching of his left hand, lasting a total of 90 seconds. He then appeared confused and was back to baseline approximately 10 minutes after the episode began.

The patient’s past medical history was notable for a prolonged febrile seizure at age 18 months but was otherwise unremarkable. He took no medications and had no family history of seizures. He drank two to three glasses of wine a week. He denied tobacco or illicit drug use. Physical and neurologic examination were unremarkable. Brain MRI revealed atrophy of the right mesial temporal region and increased T2 signal in the right hippocampus (FIGURE 1-3). EEG revealed right temporal slowing and epileptiform sharp waves (FIGURE 1-4).

FIGURE 1-3
Imaging of the patient in CASE 1-1. Coronal MRI reveals atrophy of the right mesial temporal region and increased signal in the right hippocampus (FIGURE 1-3).

FIGURE 1-4
EEG of the patient in CASE 1-1. Longitudinal bipolar montage EEG recording shows right temporal slowing and anterior temporal spike-and-slow-wave epileptiform discharge.
Non-epileptic episodic spells

- Physiologic
- Psychogenic
- Neurologic
- Non-neurologic
Neurological

- Cerebrovascular events
  - Transient ischemic attacks
- Migraine
- Movement disorders
  - Paroxysmal dyskinesia
  - Dystonia
  - Tremor

Non-neurological

- Syncope
  - Vasovagal
  - Cardiogenic
  - Hypotensive
- Sleep disorders
  - Non-REM sleep disorders, e.g., confusional arousal
  - REM sleep disorder
<table>
<thead>
<tr>
<th>Type of Paroxysmal Event</th>
<th>Premonitory Symptoms</th>
<th>Spell Characteristics</th>
<th>Usual Duration</th>
<th>Postspell Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absence seizure</td>
<td>None</td>
<td>Staring, automatisms</td>
<td>&lt;10 seconds</td>
<td>None</td>
</tr>
<tr>
<td>Focal seizure with loss of awareness (complex partial seizure)</td>
<td>Variable aura or brief (10–30 seconds) sensory march</td>
<td>Staring, automatisms, variably preserved posture</td>
<td>30–180 seconds</td>
<td>Common: amnesia, aphasia, sleepiness, confusion, variable incontinence</td>
</tr>
<tr>
<td>Tonic-clonic seizure</td>
<td>Aura variable</td>
<td>Brief tonic posturing, ensuing clonic movements</td>
<td>1–3 minutes</td>
<td>Requisite; amnesia, sleep, incontinence, tongue biting/injury</td>
</tr>
<tr>
<td>Psychogenic spell/attack</td>
<td>Variable</td>
<td>Variable responsiveness, nonstereotyped, unusual movements</td>
<td>Often prolonged (&gt;5–10 minutes)</td>
<td>Variable, often none</td>
</tr>
<tr>
<td>Syncope</td>
<td>Frequent; lightheaded, dizziness</td>
<td>Falling, eye closure, variable movements</td>
<td>1–5 minutes</td>
<td>Variable, often none</td>
</tr>
<tr>
<td>Migraine</td>
<td>Prolonged sensory march (minutes)</td>
<td>Often “positive” symptoms (e.g., paresthesia, photopsia)</td>
<td>20–60 minutes</td>
<td>Headache</td>
</tr>
<tr>
<td>Transient ischemic attack</td>
<td>Rapid sensory march (1–10 seconds)</td>
<td>Often “negative” symptoms (e.g., dead numbness, weakness)</td>
<td>&lt;60 minutes</td>
<td>None</td>
</tr>
<tr>
<td>Parasomnia</td>
<td>None</td>
<td>Vocalization, confusion, ambulation</td>
<td>Minutes</td>
<td>Amnesia, confusion</td>
</tr>
<tr>
<td>Cataplexy</td>
<td>Emotional provocation</td>
<td>Muscle atonia, preserved consciousness or sleep attack</td>
<td>Seconds to minutes</td>
<td>None</td>
</tr>
</tbody>
</table>
Psychogenic nonepileptic seizures

- One of the most common imitators of refractory epilepsy
- Estimated 25-30% of patients with refractory epilepsy often have psychogenic nonepileptic seizures (PNES)

Risk factors
- History of physical/emotional/sexual trauma or abuse
- Presence of psychiatric co-morbidities, most commonly depression
<table>
<thead>
<tr>
<th>Signs</th>
<th>Examination Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychogenic nonepileptic seizures</td>
<td>Long duration, fluctuating course, asynchronous movements, pelvic thrusting, side-to-side head or body movement, ictal eye closure, ictal crying/weeping, memory recall for period of unresponsiveness</td>
</tr>
<tr>
<td>Epileptic seizures</td>
<td>Occurrence from EEG-confirmed sleep, postictal obtundation/confusion, stertorous breathing postictally</td>
</tr>
</tbody>
</table>

EEG = electroencephalogram.

$^a$ Data from Avbersek A, Sisodiya S, J Neurol Neurosurg Psychiatry.\(^1\) [jnnp.bmj.com/content/81/7/719.abstract]; Mellers JD, Postgrad Med.\(^2\) [pmj.bmj.com/content/81/958/498.full].

$^b$ No single sign distinguishes psychogenic nonepileptic seizures from epileptic seizures.

$^c$ Visual fixation can be elicited by placing a mirror in front of the patient or rolling the patient from one side to the other.
PNES

Diagnosis

➢ Video-EEG testing is gold-standard for diagnosing PNES
➢ Ambulatory/home EEG may be useful but in-hospital EEG often preferred

Treatment

➢ Targeted cognitive-behavioral therapy is the treatment of choice
➢ Goal to remove predisposing, precipitating and perpetuating factors
➢ Treatment of co-morbidities
Epilepsy: Approach to treatment

1. Evaluation of seizure type – provoked/symptomatic vs unprovoked
2. Evaluation of possible etiology and defining epilepsy syndrome, if any
3. Evaluation of risk of seizure recurrence
| Patients at Increased Risk for Seizure Recurrence After First Seizure: American Academy of Neurology Guideline Analysis$^a$
|---------------------------------------------------------------|

- Patients with prior brain lesion or insult (remote symptomatic)
- Epileptiform EEG abnormality
- Significant brain-imaging abnormality
- Nocturnal seizure

EEG = electroencephalogram.

$^a$ Data from Krumholz A, et al, Neurology. 6 www.neurology.org/content/84/16/1705.full.
Choosing antiepileptic drug

Rules to follow

1. Choosing most-effective medication for type of seizure
2. Considering side-effect profile of AEDs and patient characteristics
3. Considering convenience of administration
4. Considering cost
Introduction of anti-seizure drugs (ASDs) to the market from 1853 to 2019.

<table>
<thead>
<tr>
<th>Antiepileptic Drug</th>
<th>Seizure Types</th>
<th>Age (y)</th>
<th>Monotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbamazepine</td>
<td>CPS, GTC, mixed</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Clonazepam</td>
<td>LGS, akinetic, MYO, ABS</td>
<td>—</td>
<td>Yes</td>
</tr>
<tr>
<td>Clorazepate</td>
<td>Partial</td>
<td>—</td>
<td>No</td>
</tr>
<tr>
<td>Diazepam</td>
<td>Convulsive disorders</td>
<td>—</td>
<td>No</td>
</tr>
<tr>
<td>Ethosuximide</td>
<td>ABS</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Phenobarbital</td>
<td>NS</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>CPS, GTC (neurosurgery)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Pregabalin</td>
<td>Partial onset</td>
<td>Adult</td>
<td>No</td>
</tr>
<tr>
<td>Primidone</td>
<td>NS</td>
<td>—</td>
<td>NS</td>
</tr>
<tr>
<td>Valproic acid</td>
<td>CPS, ABS</td>
<td>—</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Multiple including ABS</td>
<td>—</td>
<td>No</td>
</tr>
<tr>
<td>Felbamate</td>
<td>Partial</td>
<td>Adults</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Partial and generalized in LGS</td>
<td>Children</td>
<td>No</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>Partial</td>
<td>≥3</td>
<td>No</td>
</tr>
<tr>
<td>Lamotrigine</td>
<td>Partial, generalized in LGS, PGTC</td>
<td>&gt;1</td>
<td>Conversion to monotherapy (&gt;16 years old)</td>
</tr>
<tr>
<td>Lacosamide</td>
<td>Partial</td>
<td>&gt;16</td>
<td>No</td>
</tr>
<tr>
<td>Levetiracetam</td>
<td>Partial, MYO, PGTC (&gt;6 years old)</td>
<td>≥4</td>
<td>No</td>
</tr>
<tr>
<td>Oxcarbazepine</td>
<td>Partial</td>
<td>&gt;2</td>
<td>Yes (&gt;4)</td>
</tr>
<tr>
<td>Rufinamide</td>
<td>LGS</td>
<td>≥3</td>
<td>No</td>
</tr>
<tr>
<td>Tiagabine</td>
<td>Partial</td>
<td>&gt;12</td>
<td>No</td>
</tr>
<tr>
<td>Topiramate</td>
<td>Partial, PGTC, LGS</td>
<td>&gt;2</td>
<td>Yes (&gt;10)</td>
</tr>
<tr>
<td>Zonisamide</td>
<td>Partial</td>
<td>Adults</td>
<td>No</td>
</tr>
<tr>
<td>Vigabatin</td>
<td>Infantile spasms</td>
<td>Children</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Refractory CPS</td>
<td>Adults</td>
<td>No</td>
</tr>
</tbody>
</table>

CPS = complex partial seizures; GTC = generalized tonic-clonic seizures; LGS = Lennox-Gastaut syndrome; MYO = myoclonic seizures; ABS = absence seizures; NS = not specified; PGTC = primary generalized tonic-clonic seizures.

### Antiepileptic Drug Preferences in Special Circumstances

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>Antiepileptic Drug Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>Lamotrigine, oxcarbazepine</td>
</tr>
<tr>
<td>Migraine</td>
<td>Topiramate, valproate</td>
</tr>
<tr>
<td>Chronic pain</td>
<td>Pregabalin, gabapentin, oxcarbazepine, carbamazepine, lacosamide</td>
</tr>
<tr>
<td>Obesity</td>
<td>Topiramate, zonisamide</td>
</tr>
<tr>
<td>Woman of childbearing potential</td>
<td>Avoid pregabalin, gabapentin, valproate</td>
</tr>
<tr>
<td>Older adult</td>
<td>Avoid valproate</td>
</tr>
<tr>
<td>Asian</td>
<td>Lamotrigine, gabapentin, topiramate</td>
</tr>
<tr>
<td>Nephrolithiasis</td>
<td>Avoid carbamazepine</td>
</tr>
<tr>
<td>Atopic (rash prone)</td>
<td>Avoid topiramate and zonisamide</td>
</tr>
<tr>
<td></td>
<td>Avoid lamotrigine, carbamazepine</td>
</tr>
</tbody>
</table>
AED: General considerations

- Risk of allergic reaction is present with all anti-seizure medication; highest for lamotrigine, carbamazepine
- Risk of suicidal ideations and mood changes is present with all anti-seizure medications
- Dose titration is often required for most anti-seizure medications
- Use FDA prescribing information for all medications as a guide for initial and maintenance dose
- Study blackbox warnings and common precautions for any agent being tried
Epilepsy comorbidities

- Psychiatric disorders
  - Depression: 23%
  - Anxiety: 20%
  - Suicide: 3 times higher risk
  - Attention deficit

- Memory impairment
The SUDEP is a sudden, unexpected, nontraumatic, nondrowning death in a person with epilepsy.

Incidence of SUDEP is 1:4500 children with epilepsy in 1 year and 1:1000 adults with epilepsy in 1 year.

Risk Factors for Sudden Unexpected Death in Epilepsy

<table>
<thead>
<tr>
<th>Factor</th>
<th>Strength of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of generalized tonic-clonic seizures (present versus not present)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Frequency of generalized tonic-clonic seizures &gt;3 per year</td>
<td>High</td>
</tr>
<tr>
<td>Uncontrolled seizures</td>
<td>Moderate</td>
</tr>
<tr>
<td>Failure to adjust medication for treatment-refractory seizures</td>
<td>Moderate</td>
</tr>
</tbody>
</table>
Driving and epilepsy

- Inability to drive is one of the most disabling factor in epilepsy
- In United States, each state has its own rules and regulation
  - Primarily determined by duration of seizure freedom, ranging from 3 to 12 months among states
  - Some states requires mandatory reporting of patients with seizures
- In Oklahoma
  - 6-month seizure freedom required (some exceptions)
Medically Refractory Epilepsy

- ILAE defined medically intractable epilepsy, as “a failure of adequate trials of two tolerated, appropriately chosen and used anticonvulsant drug schedules (whether as monotherapies or in combination) to achieve sustained seizure freedom.”

- Refractory epilepsy
  - Increased risk for premature death, injuries, psychosocial problems and death
  - Increased economic burden – total national cost for acute care of patients with epilepsy in 2008 was $2.7 billion.
Refactory Epilepsy

- Adverse Effects of ASDs
- Cognitive Problems
- Persistent Seizures
- Neurochemical Changes
- Increased Mortality, Greater Risk for SUDEP, Comorbidities
- Restricted Quality of Life
- Educational, Vocational, Social Consequences
- Mood and Personality Changes

Refractory epilepsy can be identified early!!

- 525 patients with epilepsy
  - 63% of patients remained seizure free during anticonvulsant treatment or after treatment was stopped.

- Seizure-free rates were similar between established drug (67%) and a new drug (69%).

- Among the 470 patients previously untreated, 47% became seizure free during treatment with the first drug and 14% became seizure free after treatment with the second or third drug.

Therapeutic Options for Refractory Epilepsy

- Resective surgery
- Antiepileptic agents
- Dietary therapies
- Neurostimulation
- Experimental drug/device trials
Comprehensive Epilepsy Center

Confirm the diagnosis of epilepsy
- Rule out nonepileptic seizures
- Rule out pseudoresistance due to wrong diagnosis, wrong AED doses, and nonadherence to medications

Try other treatment modalities in appropriate settings, such as ketogenic diet and behavioral therapy

Presurgical Evaluation

In true drug-resistant epilepsy:
- Imaging: MRI 3T/7T, PET, ictal SPECT, and functional MRI
- EEG: long-term video-EEG monitoring to characterize habitual seizures
- Neuropsychological testing
- Wada test, if necessary

Intracranial Monitoring

When indicated:
- Video-EEG monitoring with intracranial electrodes
  - Grids/strips/depth electrodes
  - Stereo-EEG
- Functional brain mapping

Surgery and Other Treatment

Resective surgery
- Laser interstitial thermal therapy; consider for a deep lesion, mesial temporal sclerosis, cavernous malformation
- Responsive neurostimulation; consider when seizure onset zone is in eloquent cortex or ≤2 foci
- Vagal nerve stimulation; consider when seizure onset zone is generalized or >2 foci
THANK YOU
References


References


Questions

Email: Bhrugav-Raval@ouhsc.edu