Seizures, convulsions and epilepsy

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Terminology

• **Seizures**: Transient occurrence of clinical symptoms due to abnormal neuronal behavior
  – *Convulsions*: Seizures with prominent body movement
  – *Non-convulsive seizures*: Seizures with minimal or no body movement

• **Epilepsy**: Brain disorder with an enduring predisposition to generate epileptic seizures

• **Epilepsy syndromes**: Groups of epileptic patterns of varying cause but similar course and response to treatment
Epilepsy

- Second most common neurological disorder
- USA:
  - Prevalence: ~1% (2.5 million)
  - Incidence: 125,000-180,000 new cases per year
  - Total annual epilepsy-associated costs: $12.5 billion
- Occurs at all ages
The Relationship Between Age and Seizure Disorder (cont'd)

Identifying Seizure Types

Generalized

Absence
Myoclonic
Tonic-clonic (primary)
Tonic
Clonic
Atonic

Partial

Simple partial
Complex partial
Secondarily generalized

Adapted from Morrell.
Simple partial seizure
Complex partial seizure
Generalized tonic-clonic seizures

- Loss of consciousness
- Fall, cry
- Muscular rigidity (tonic)
- Rhythmic jerking (clonic)
- Respiration inhibited
- Tongue bite/ incontinence/ injury can occur
- Usually lasts 1-3 minutes
- Postictal confusion
Absence seizure
Section IV: Semiology of Epileptic Seizures
Chapter 33
Myoclonic Seizures
N. So
Video by H.O. Lüders & S. Noachtar 1995
Case 1
Generalized myoclonic seizure ->
generalized tonic-clonic seizure
(Juvenile myoclonic epilepsy)
Video from H.O. Lüders & S. Noachtar 1995
Status epilepticus

• Definition:
  – Two or more seizures without recovery of consciousness in between
  – Single seizure >20-30 min (operationally, >5 min)

• Types:
  – Generalized convulsive
  – Non-convulsive
  – Simple partial
Epilepsy syndromes

- Diagnosis made through determining
  - Seizure type
  - Etiology (cause)
  - Age of onset and natural history
- Types:
  - Partial (localization-related)
  - Generalized
  - Undetermined
  - Special syndromes
Common epileptic syndromes

- Temporal lobe epilepsy
- Juvenile myoclonic epilepsy
- Childhood absence epilepsy
Genetics of epilepsy

- No single epilepsy gene
- Familial incidence highest in childhood onset with no underlying disease
- Genetic epilepsies: Generalized or partial
- Specific chromosomes: e.g. JME, BFNC
- Several new genetic syndromes identified: ADNFLE, GEFS+ etc.
Causes of Seizures
Partial seizures

- Hypoxia
- Depressed skull fracture
- Tumor
- Unknown or cryptogenic
- Infection
- Cortical dysplasia
- Hemorrhage
- Infarct
- Vascular malformation
Evaluation of seizures

- History
  - Patient
  - Eyewitness
- Physical/neuro exam
- EEG
  - Photic stimulation
  - Hyperventilation
  - Sleep deprivation
- Imaging
  - CT scan
  - MRI
- Special studies
  - Ictal SPECT
  - PET
- Video-EEG monitoring
  - Diagnostic
  - Presurgical
Generalized EEG seizure pattern
Focal spikes
MRI in temporal lobe epilepsy

Normal hippocampus

Shrunken hippocampus (MTS)
Acute Management of Tonic-Clonic Seizure

**DO**

- Attempt to time duration of seizure
- Help patient lie down and roll onto side to help avoid aspiration
- Loosen clothing and remove glasses
Acute Management of Tonic-Clonic Seizure

**DO NOT**

- Do NOT attempt to place anything in the patient’s mouth, including medication and water
- Do NOT leave patient lying on back
- Do NOT restrain during or after seizure; may provoke aggressive behavior or cause injury
First aid for other seizure types

- CPS:
  - Keep the person away from dangerous situations
  - Speak quietly and reassuringly; use restraint only if necessary for safety

- SPS and absence:
  - Rarely require first aid
  - Protect from dangerous situations
Acute management of seizures

- Call physician or ambulance if:
  - Seizure lasts more than 5 minutes
  - Patient has recurrent seizures
  - Patient does not begin to regain consciousness soon after seizure
  - Patient has major injuries from the seizure
  - First seizure
Treatment of epilepsy

- Single seizure: May or may not treat depending on likelihood of recurrence
- Epilepsy:
  - Antiepileptic drugs
  - Surgery
  - Vagus nerve stimulation
  - Ketogenic diet
Standard AED

- Phenytoin (Dilantin): oral, IV, fosphenytoin
- Carbamazepine (Tegretol): oral
- Valproic acid (Depakote): oral, IV
- Phenobarbital (Luminal): oral, IV
- Primidone (Mysoline): oral
- Ethosuximide (Zarontin): oral
- Benzodiazepines: Diazepam, lorazepam, clonazepam (CZP) - oral, IV, rectal
New AED - oral

• Gabapentin (Neurontin)
• Lamotrigine (Lamictal)
• Topiramate (Topamax)
• Tiagabine (Gabitril)
• Levetiracetam (Keppra)
• Oxcarbazepine (Trileptal)
• Zonisamide (Zonegran)
• Felbamate (Felbatol)
Choice of AED

- Type of seizure/epileptic syndrome
- Potential side effects
- Frequency of dosing
- Comorbid conditions
- Drug interactions
- Age, gender
- Cost of drug
Response to AED

- Newly diagnosed epilepsy
  - First drug
    - 47% Seizure-free
  - Second drug
    - 13% Seizure-free
    - 40% Seizure-free
- Refractory
  - Rational duotherapy
  - Surgical assessment, VNS, ketogenic diet

Adapted from Brodie MJ, Schachter SC. Epilepsy, 2nd edition, 2001
Other treatment options

- Epilepsy surgery:
  - Medically refractory partial epilepsy
  - Detailed presurgical evaluation
- Vagus nerve stimulation, ketogenic diet:
  - Medically refractory partial epilepsy, not surgical candidates
  - Lennox-Gastaut syndrome