Seizures
Epilepsy
and
Status Epilepticus

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Allison M. Goodell, RN, MS
Clinical Nurse Specialist, Neurosciences Albany Medical Center

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Course Outline

- Seizures & Epilepsy
  - Definitions
  - Statistics
  - Causes
  - Classification
- Status Epilepticus
  - Definition
  - Statistics
  - Classification
  - Etiology
  - Treatment
- Down the Road

Objectives

At the conclusion of this talk, participants should be able to:

- Explain the pathophysiology of a seizure
- List common causes for “symptomatic” seizures
- Explain the priority of care for a patient having a seizure
Seizures: Definition

- Abnormal, paroxysmal electrical discharges in the cerebral cortex
- A seizure starts when a tiny cluster of brain cells begins to emit rapid, highly rhythmic, synchronized, and repetitive electrical discharges
- The malfunction may remain localized to a small area or, within seconds, involve the entire brain

Seizures: Definition

- Alteration in sensation, behavior, movement, perception, or consciousness
- May consist of a brief or blank stare lasting a second, or may be a tonic-clonic seizure that lasts several minutes
- The clinical presentation reflects the region of the brain in which the discharge arises or spreads

Seizures: Statistics

- 300,000 people have a first convulsion each year
- 120,000 of them are under the age of 18.
- Between 75,000 and 100,000 of them are children under the age of 5 who have experienced a febrile (fever-caused) seizure.
Epilepsy

- Chronic disorder characterized by a spontaneous tendency for recurrent seizures
- Not considered a disease, but a symptom of a CNS disorder
- All people with epilepsy have seizures, but not everyone with seizures has epilepsy

Epilepsy Statistics

- Prevalence is approximately 2.7 million in the United States
- Prevalence ↑s with age
- 200,000 new cases of epilepsy are diagnosed each year
- Greatest incidence: < 2 yrs, and > 65 yrs
- Higher incidence in older adults may be related to strokes, brain tumors, Alzheimer’s disease, or aging of the brain

Seizures: Causes

- Idiopathic
- Symptomatic
Idiopathic Seizures

- If no underlying cause is found, then the seizure is said to be idiopathic
- About 2/3rds of all seizures are idiopathic

Symptomatic Seizures

- Seizures can be isolated events caused by a CNS d/o
- They are symptomatic (secondary) seizures
- Once the d/o is corrected, many times seizures do not recur:
  - Febrile convulsions
  - Drug or alcohol withdrawal
  - Metabolic disturbances (low glucose)
  - Acute CNS insult (head injury)

Risk Factors

- Perinatal Problems (toxemia, low birth weight, hypoxia)
- Head Trauma
- CNS infections
- Brain Tumors
- Stroke, Cerebrovascular disease, aneurysm, AVM
- Complex febrile convulsions
- ETOH or drug abuse
- Family history
- Toxic and metabolic disturbances
- Anoxia
- Degenerative diseases: Alzheimer’s disease and MS
- Cerebral Palsy
- Mental Retardation
- Congenital malformations of the CNS
Classification of Seizures

- Partial (Focal Seizures)
  - Simple partial seizures
  - Complex partial seizures
  - Partial generalizing to generalized tonic-clonic

- Generalized Seizures
  - Absence seizures
  - Myoclonic seizures
  - Atonic seizures
  - Tonic seizures
  - Clonic seizures
  - Tonic-clonic seizures

- Unclassified

1989 International Classification of Epileptic Seizures

Partial (Focal Seizures)

- AKA Jacksonian seizures

- Arise from a focal area of the brain
  - Simple partial seizures
  - Complex partial seizures
  - Partial generalizing to generalized tonic-clonic

Simple Partial

- Usually confined to a restricted/focal area of the brain
- Motor, sensory, autonomic, or psychic symptomatology
- No loss of consciousness
- Sometimes called an aura
- Don’t involve both hemispheres
- Can occur in isolation, or prior to a complex partial or tonic clonic seizure
- <1/3 have EEG changes
- C/V disease is common cause in new-onset in older adults
Complex Partial Seizures
- AKA psychomotor or temporal lobe seizures
- Alteration in consciousness
- May spread to both hemispheres
- May begin with motionless state, then oral-alimentary, hand, or gestural automatisms
- Eye movement, speech disturbance
- Automatisms: lip smacking, chewing, picking at clothes
- Patient continues to perform activities although LOC

Generalized Seizures
- Involve both cerebral hemispheres from the onset
- Consciousness is immediately impaired in most types
  - Absence seizures
  - Myoclonic seizures
  - Atonic seizures
  - Tonic seizures
  - Clonic seizures
  - Tonic-clonic seizures

Absence seizures
- AKA petit mal
- Brief LOC, lasting 10-15 seconds
- Typical or atypical
- Typical: sudden behaviors arrest and unresponsiveness w/ eyelid or facial clonus, automatisms, and autonomic, tonic, atonic features
- Atypical: Exceed 10 seconds, begin and end more gradually, less marked altered LOC. Tonic, clonic, myoclonic features
Myoclonic seizures
- Can involve either a single muscle group or multiple muscle groups
- Patient may fall forward or backward
- Single or repetitive, bilaterally synchronous and symmetric, rapid muscular contractions
- No LOC
- Often occur early in am

Atonic seizures
- Loss of muscle tone
- Mild, resulting in a brief head nod
- May fall forward at the waist, or lose all tone and fall
- May last 1 to 2 seconds
- Consciousness impaired only momentarily
- “Drop attacks”
- May need to wear a helmet

Tonic Seizures
- Sustained, nonvibrating contraction involving flexion or the UE’s and flexion or extension of the LE’s
- (+) LOC, autonomic alterations occur
- Usually last 10 – 60 seconds
- Abrupt in onset and followed by rapid return to baseline
- Occur in clusters during drowsiness and non REM sleep.
- Can occur dozens of times a day
Clonic Seizures

- Rare
- May be seen in children during episodes of illnesses with high fever
- Abrupt LOC, with hypotonia, or generalized tonic spasm
- May be confused with tonic-clonic seizures
- Regular, repeated, short contractions or myoclonic jerks of various muscle groups, and may affect the distal segments of the body
- May spread into the primary motor area of the contralateral hand or facial area

Tonic-Clonic Seizures

- AKA “Grand Mal”
- Most common type of seizure in childhood, adolescence, adulthood
- A “normal” seizure
- Preictal state, seizure state, postictal state
- May begin as simple partial seizures or chronic partial seizures and then secondarily generalize
- Begin bilaterally
- First phase is tonic, with stiffening of muscles

- Rigidity may involve respiratory muscles, causing patient to cry out
- May stop breathing and become cyanotic
- Tongue biting and urinary or fecal incontinence
- Then confusion, complaint of h/a, or sleepy
- Can be any combo of tonic and clonic movement
- Postictal state may be characterized by a temporary Todd’s Paralysis (Todd’s paralysis is a transient postictal paralysis that occurs on the same side as the seizure)
Unclassified Seizures

- Inadequate data to fit into either partial or generalized category

Definition of Status Epilepticus

- More than 30 minutes of continuous seizure activity during which the patient does not regain full consciousness
- Or, two or more sequential seizures without full recovery of consciousness between seizures

Status Epilepticus Statistics

- Potentially life threatening medical emergency that can result in transient or permanent brain damage
- Incidence high in older adults
- Highest incidence is in children
Status Epilepticus Incidence

- US frequency is 100,000 to 150,000 per year

Etiology

- CNS insults
  - Anoxia
  - Hypoxia
- CNS infection
- Cerebral neoplasm
- Craniocerebral trauma
- Cerebrovascular disease
- Toxic conditions

Etiology

- Metabolic disorders
  - Respiratory and metabolic acidosis
  - Hyperazotemia (↑'d urea)
  - Hypokalemia
  - Hyponatremia
  - Hyperglycemia, followed by hypoglycemia
- Medication adjustment and noncompliance of antiepilepsy drugs or drug withdrawal
- Undetermined (approximately 1/3 of all cases)
Generalized Status Epilepticus

- Generalized Convulsive Status Epilepticus (GCSE)
  - Tonic-clonic seizures
  - Most common and life threatening form
  - No return to full consciousness or the baseline state
  - Neuronal death may result from prolonged electrical discharges
  - Common cause is failure to take AED
  - Can cause hypoxia and neuronal metabolic exhaustion

Generalized Status Epilepticus

- Generalized Nonconvulsive Status Epilepticus
  - Not life threatening
  - Should also be treated aggressively to minimize the risk of neuronal injury

Partial Status Epilepticus

- Simple partial SE (focal motor or epilepsy partialis continua) and Complex partial SE
  - Consciousness usually remains intact
  - Motor activity is localized to one area of the body, such as face or hand
  - Complex partial SE manifests as a prolonged confusional state resulting from continuing or recurring seizures
  - Automatisms and speech difficulty may be present
Treatment

- The goal of treatment is to stop the firing of the cerebral neurons and to correct the underlying cause!!

Keep the Patient Safe!!

- Turn on side to minimize risk of aspiration
- Remove items that might cause injury from around patient
Medications

- Usually start with a short acting benzodiazepine IV
  - Lorazepam (Ativan ®)
  - Diazepam (Valium ®)
- If no IV access, give rectal diazepam

ABC’s

- Airway
  - Intubate if patient unable to maintain airway
  - Suction to prevent aspiration
  - Intubate as needed
- Breathing
  - Supplemental O2 to maintain oxygenation
  - Intubate if respiratory suppressed
- Circulation
  - IV access
  - Anticonvulsants
  - LABS

If Seizures Continue:

- Load with Dilantin 20 mg/kg/load, given no faster than 50 mg/min
- May also use Fosphenytoin 15 to 20 mg/kg (may infuse faster, up to 150 mg/min)
What Next???
Perform a physical exam, including:

- Obtain vital signs and repeat every 5-10 minutes,
- Evaluate mental status
- Evaluate the cardiovascular, neurologic, and musculoskeletal systems

History
- Was there any warning?
- Any loss of consciousness?
- Any incontinence?
- Has there been any stress?
- Any associated trauma?
- Have a witness describe the episode.

Attempt to ascertain the following

**O.P.Q.R.R.S.T**
- Onset
- Provocation
- Quality
- Region
- Recurrence
- Relief
- Severity
- Time

**S.A.M.P.L.E**
- Signs/Symptoms
- Allergies
- Medications
- PMHx
- Last Oral Intake
- Events Leading Up To Incident
Seizures

- Occurs day or night, regardless of the posture
- Cyanosis may occur
- Often have an aura
- Injury from falling is common
- Return to alertness is usually slow. Prolonged state may include drowsiness and confusion.
- Urinary and bowel incontinence is common.
- Repeated spells of LOC several per day or month.

Syncope

- Rarely occurs when laying down
- Pt is often pale
- No advance knowledge of impending seizure.
- Injury is rare
- Prompt return to alertness
- Urinary incontinence is rare.

Lab Studies

- Electrolytes to r/o metabolic causes
- Glucose to r/o hypoglycemia or hyperglycemia
- Calcium
- Magnesium
- BUN and creatinine
- CBC with differential
- Liver profile, toxicology to r/o alcohol or drug abuse
- AED levels
- ABG studies to r/o hypoxia and acidosis

DOCUMENTATION

- Record level of consciousness pre and post administration of medications
Treatment

- If seizures continue:
  - May place patient in a pharmacologic coma with a barbiturate
  - Patient is continuously EEG monitored so that burst suppression is achieved
  - Burst suppression is a phenomenon seen on EEG that indicates loss of cortical brain activity

Find the Cause

- Follow up on all lab studies
- Maintain therapeutic anti-convulsant levels
- CT/MR to r/o tumor/bleed

Further down the road…
Long Term Video/EEG Monitoring

- Assists epileptologists to evaluate, diagnose, and treat patients whose epilepsy is not responsive to conventional medical treatment.

- This is done via continuous, or "Long Term" video, voice, and EEG recording, which helps characterize the seizure type, localize the area where the seizure begins and exclude non-epileptic seizures from the diagnosis.

- The information obtained from this monitoring allows the Epilepsy team to recommend therapy to treat seizure disorders. This includes medication, lifestyle changes, vagal nerve stimulation, or surgical treatment.

Each bedside is equipped with video, voice, and EEG monitoring equipment, where the patient will monitored 24 hours a day, for the length of their admission.
Lobectomy

- A lobectomy may be performed when a person has seizures that start in the same lobe every time. It is sometimes possible to stop the seizures by removing the seizure-producing area if it can be safely done without damaging vital functions.

- A lobectomy can remove all or part of these areas: temporal lobes, frontal lobes, parietal lobes and occipital lobes.
Hemispherectomy

- A hemispherectomy can be performed for severe brain disease on just one side of the brain which produces uncontrollable seizures and paralysis on the opposite side of the body.

- It seems impossible that someone could function with only half a brain, but in children the half that is left may take over some of the functions of the part that was removed.

Hemispherectomy

- There will be weakness and loss of some movement on the opposite side of the body.

- There will also be a loss of peripheral (side) vision.
Corpus Callosotomy

- The corpus callosotomy interrupts the spread of seizures by cutting the nerve fibers connecting one side of the brain to the other.

- The seizures which may respond to this type of surgery include uncontrolled generalized tonic clonic (grand mal) seizures, drop attacks, or massive jerking movements.

Corpus Callosotomy

- These seizures affect both sides of the brain at once and there is usually no one area which can be removed to stop them from happening.

- Seizures are usually not stopped entirely by the operation. Some type of seizure activity on one side of the brain or the other is likely to continue, but the effects are generally less severe than the repeated drop attacks or convulsions.
Medication Change

- Based on the information obtained from the long-term EEG/video monitoring, the epileptologist may find that the patient had been originally misdiagnosed as to where the focus of his or her seizure was.

- Medication changes may be indicated, rather than surgery, to successfully treat that patient’s epilepsy.

Psychiatric Consult

- Pseudoseizures are a physical manifestation of a psychological disturbance. They are a type of conversion disorder and are usually involuntary.

- Pseudoseizures are commonly misdiagnosed as epilepsy. They are the most frequent nonepileptic condition seen in epilepsy centers, where they often represent 15-22% of referrals.

Questions???
References

www.epilepsyfoundation.org
