Epilepsy

Presented By: Stan Andrisse
What Is Epilepsy

• Chronic Neurological Disorder

• Characterized by seizures

• Young children or elderly

• Developing countries
Famous Cases

- Socrates
- Aristotle
- Julius Caesar
- Napoleon
- Pythagoras
- Muhammad
- Joan of Arc
- Multiple Saints
- Beethoven
- Isaac Newton
Classification

- First Cause
- Observable manifestations
- Origination location in the brain
- Identifiable medical syndromes
- Triggering event/Age of onset
Seizure Types

Partial/Focal Onset (Localized)
- Simple Partial
  - Consciousness affected
- Complex Partial
  - Psychomotor

Unknown Localization
- Single Seizures
- Provoked Seizures
  - Febrile Convulsions

Generalized (Distributed)
- Loss of consciousness
- Multifocal/Circuits
- Types
  - Absence (petit mal)
  - Myoclonic
  - Clonic
  - Tonic
  - Atonic

(Vendrame 2011)
Seizure Types (cont)

- Partial (focal) vs Generalized
Seizure Types (cont)

- Over 40 different types

- Triggers
  - Reflex (reading)
  - Photosensitive
  - Hyperventilation
  - Emotional stress
  - Sleep deprivation
  - Alcohol
  - Menstrual cycle

- Common Mistaken Behaviors
  - Blind Stares
  - Shudders
  - Self-gratification
    - Nodding, rocking, etc
Causes

**Idiopathic**
- Genetic abnormalities
  - Ring Chromosome 20 Syndrome
- Altered neuronal regulation

**Symptomatic**
- Epileptic lesion
  - Focal (tumor)
  - Defect in metabolism
- Widespread Brain injury

**Cryptogenic**
- Presumptive lesion
- Difficult diagnosis
Causes (cont)

- CNS infections/abnormalities
- Metabolic disorders
- Head trauma
- Hypoxic-encephalopathy
- Age-related onset
- Stress
- Brain tumor
- Illicit drug use
- Alcohol withdrawal
Mesial Temporal Lobe Epilepsy: Pathogenesis, Induced Rodent Models and Lesions

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ABSTRACT

Mesial temporal lobe epilepsy (MTLE), the most common epilepsy in adults, is generally intractable and is suspected to be the result of recurrent excitation or inhibition circuitry. Recurrent excitation and the development of seizures have been associated with aberrant mossy fiber sprouting in the hippocampus. Of the animal models developed to investigate the pathogenesis of MTLE, post-status epilepticus models have received the greatest acceptance because they are characterized by a latency period, the development of spontaneous motor seizures, and a spectrum of lesions like those of MTLE. Among post-status epilepticus models, induction of systemic kainic acid or pilocarpine-induced epilepsy is less labor-intensive than electrical-stimulation models and these models mirror the clinicopathologic features of MTLE more closely than do kindling, tetanus toxin, hyperthermia, post-traumatic, and perinatal hypoxia/ischemia models. Unfortunately, spontaneous motor seizures do not develop in kindling or adult hyperthermia models and are not a consistent finding in tetanus toxin-induced or perinatal hypoxia/ischemia models. This review presents the mechanistic hypotheses for seizure induction, means of model induction, and associated pathology, especially as compared to MTLE patients. Animal models are valuable tools not only to study the pathogenesis of MTLE, but also to evaluate potential antiepileptogenic drugs.

Keywords: Mesial temporal lobe epilepsy; MTLE; rodent models; hippocampus; seizures; mechanisms; histopathology; lesions.

• Most common adult epilepsy
• Hippocampal Sclerosis (HS)
• Recurrent Excitation/Inhibition
• Post-status epilepticus mice
  • Latency
  • Motor seizures
• Religious/mystic hallucinations
• Similar lesions
PathoPhysiology of MTLE

- A) Bregma-3.12
  - Cranial Hippocampus

- B) Bregma-5.28
  - Caudal Hippocampus

- C) Sub-anatomic Hippocampus

- D) Hippocampal network
  - unidirectional
Genetic investigations on 8 patients affected by ring 20 chromosome syndrome

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- Idiopathic genetic abnormality
- Cognitive Impairment
- Absence of dysmorphismology
  - Birth defects
- Pathogenicity unknown
- 8 r(20) patients
- FISH characterization
  - Florescence in situ hybridization
West Syndrome

• Trademarks
  – Infantile spasms
  – Developmental Delay
  – Hypsarrhythmia
    • Abnormal EEG

• Prognosis
  – Continued seizures
  – Cognitive impairment

• Onset
  – 8-9 months

• Causes
  – Idiopathic, symptomatic, or cryptogenic
  – Tuberous sclerosis
Rasmussen’s Encephalitis

• Trademarks
  – Symptomatic-localization
  – Progressive
  – Inflammatory lesions

• Cause
  – Immunological attack on glutamate receptors
    • Excitatory transmitter

• Onset
  – Before age 10

• Pathology
  – Inflammatory encephalitis on one side of brain
Pathophysiology

• Channel Mutations
  – Voltage-gated
  – Ligand-gated

• Epileptogenesis
  – Epilepsy after trauma
  – Kindling
    • Electrical stimulus
    • Increased seizure susceptibility

• Mechanisms
  – Constitutively open Na\(^+\) channels (hyper-excite)
    • Release of glutamate
    • Excessive Ca\(^{2+}\) release
      – Neurotoxic
    • Hippocampal NMDAR
  – GABA mutations
  – Chemical stimulation
    • Pesticides
    • Excitotoxicity
Management

Medications
• Anticonvulsant
  – Lifelong
  – Decreased quality of life
  – 20 FDA approved
    • Lyrica (pregabalin)
    • Valium (Diazepam)
    • Pentobarbital (My lab uses)
    • Many black market (Mexico)
  – Goal
    • No seizures
    • Minimal side effects

Surgery
• Focal localization
• Anticonvulsant resistance
• Epileptic vs non-epileptic
  – Long-term video EEG
• Resection of lesions (Tumors)
  – Anterior Temporal Lobectomy
    • Remove front of temporal
    • Amygdala and hippocampus
    • Decreased health care cost
• Palliative
Management

**Ketogenic Diet**
- High fat, low carb
- Mechanism unknown

**Vagus Nerve Stimulation**
- Cyberonics
- Similar to pacemaker
  - Connects to vagus in neck
Literature Cited


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Thank you for your time

Questions???

Comments