BRIEF OVERVIEW OF EPILEPSY

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AIMS AND OBJECTIVES OF THIS PRESENTATION –

I. To discuss epidemiology and common terms in epilepsy
II. To discuss basic diagnosis and treatments for epilepsy
III. To explain identification of refractory or complicated epilepsy and discuss referral to a specialized center for further management
IV. To understand an overview of available medical and surgical options for epilepsy patients
• Epilepsy is defined as ‘a neurological condition with a recurrent risk for alteration in neurological function or awareness that results from abnormal electrical brain activity’.

• Worldwide prevalence - 60-75 million

• Prevalence in the USA – 1% of the population (~3 million patients)

• 2/3rd of epilepsy patients will be sufficiently controlled on medications alone.

• Rest will need additional therapies – surgery, devices, ketogenic diet, etc.

• Most patients will remain stable and well controlled on appropriate therapies, which will also be expected to minimize side effects.

• Evaluation by a specialist must be considered if seizures are poorly controlled or if there is clinical worsening or presence of severe side effects. Surgical evaluation and use of advanced therapies are also a good reason for referral.

• Multiple level 4 epilepsy centers in the country – UNMC is also a level 4 center offering all therapies and surgical options.

Common terms to describe seizures used by patients –

• Grand mal seizure

• Convulsions

• Petit mal seizure

• Absence seizures

• Drop seizures

• Jerks

• Staring spells

• Falls

• Pseudoseizures / psychogenic spells / stress seizures / Psychogenic nonepileptic spells (PNES)
Epilepsy: Etiology vs. Age of Onset

- Perinatal injury
- Metabolic defect
- Congenital malformation
- Infection
- Genetic epilepsy
- Postnatal trauma
- Brain tumor
- Vascular disease

Diagnostic tests for patients suspected or known to have epilepsy –

- EEG
  - Routine
  - Long term EEG / Epilepsy Monitoring Unit
  - Ambulatory EEG
- MRI
- Other imaging tests – PET, MEG, etc.
- Neuropsychology testing
- Genetic testing
- Blood tests – Prolactin levels, lactic acid levels, autoimmune testing, etc.
Older Antiepileptic Drugs

- Phenobarbital (1912)
- Phenytoin (1938)
- Valproic Acid (1983)
- Carbamazepine (1974)

Newer Antiepileptic Drugs

Approved since 1992
- Felbamate Felbatol 1992
- Gabapentin Neurontin 1993
- Lamotrigine Lamictal 1994
- Topiramate Topamax 1996
- Tiagabine Gabatril 1997
- Levetiracetam Keppra 1999
- Oxcarbazepine Trileptal 2000
- Zonisamide Zonegran 2000
- Pregabalin Lyrica 2005
- Lacosamide Vimpat 2009
- Rufinamide Banzel 2009

AEDs and Pregnancy

- About a quarter of women experience improved seizure control during pregnancy

- Multiple factors influence AED levels in pregnancy
  - Expansion of plasma volume
  - Decreased serum albumin
  - Increased hepatic activity

- May need to check blood levels
  - Seizures can cause acidosis/hypoxia in the fetus

- Lamotrigine and Levetiracetam are considered safest in pregnancy.

- Recommend registration at www.aedpregnancyregistry.org
AEDs and Teratogenicity

- Phenytoin/Carbamazepine/Phenobarbital
  - Craniofacial abnormalities (Cleft lip/palate)
  - Congenital heart defects
  - Skeletal deformities

- Valproate – MOST TERATOGENIC
  - 3-4 times higher risk of teratogenicity compared to other AEDs
    - Up to tenfold increase in neural tube defects!
    - Skeletal deformities

- Newer generation AEDs have around 2-3% teratogenicity compared to 5-10% with older generation AEDs

Precautionary Measures

- With first generation AEDs:
  - Calcium with Vitamin D

- In women of childbearing age (1st and 2nd generation):
  - Prenatal Vitamins
  - Folic Acid (4mg for Valproate, 2mg for others)
  - 2 forms of contraception
    - Barrier Method
    - CYP450 induction can interfere with oral contraceptives
Intractable Epilepsy
Previously Untreated Epilepsy Patients (n=470)

- 47% Seizure-free with 1st drug
- 36% Seizure-free with 2nd drug
- 13% Seizure-free with 3rd+ drugs
- 4% Intractable epilepsy


When medications fail: Think Surgery

- **Longstanding epilepsy is progressive!**
  - Cortical atrophy is seen in brain regions local and remote to the epileptogenic area
  - Changes in cognitive functioning
    - Memory and language most prominent
    - Can also be due to longstanding AED use (1st generation)
- **Sudden Unexplained Death in Epilepsy (SUDEP)**
  - Affects 0.5% of epilepsy patients per year
  - Possibly the eventual cause of death in **10%** in all patients with epilepsy
Epilepsy Surgery

• **75,000** in U.S. may benefit
• Intractable epilepsy despite:
  – Accurate diagnosis
  – **Failure of 2-3 AEDs**
    • Odds of seizure freedom on another new medication after 3 prior AEDs failed <10%

Epilepsy Surgery

• The goal of epilepsy surgery is to remove the epileptogenic onset zone
  • The brain region which initiates the seizure
  • Long term Video-EEG monitoring
• Need to prevent damage to brain areas critical to cognition
  • Wada test
    • Check memory/language function of the bilateral hemispheres
  • Noninvasive Imaging
    • fMRI/MEG
Surgical Resection

Seizure Freedom at 12 Months

Complex partial or generalized seizures

Percentage Seizure-free

Surgical

Medical

58

8

P <0.001
NNT = 2

Vagus Nerve Stimulator (VNS)
- Pulse generator implanted into chest wall
- Lead attached to left vagus nerve
- Believed to change the excitation/inhibition milieu of neurotransmitters
- Minimal surgery
  - Typically same day

Responsive Neurostimulation
- Newest device approved by the FDA for epilepsy
- Good for focal onset seizures, especially those arising from eloquent cortex
- Offers long term diagnostic and therapeutic benefits
DEEP BRAIN STIMULATION

- Newest Modality for Epilepsy
- Same technology as Parkinson’s and tremor patients but different target

- Mimickers of seizures –
  - Syncope
  - Arrhythmias
  - Drug use
  - TBI
  - Psychiatric conditions
  - Movement disorders
  - Nonepileptic spells, psychogenic
Acute Treatment of Seizures

- Remember ABCs
  - Airway
  - Breathing
  - Circulation
- IV line with NS, rapid assessment, blood draw
- Lorazepam 4 mg (0.1 mg/kg) or diazepam 10 mg (0.2 mg/kg) over 2 minutes via second IV line or rectal diazepam
- IV Thiamine 100 mg before 50% glucose 25 mg IV (if hypoglycemic)
- Leviteracetam (Keppra) 1500 mg IV (can dose q12 hours)
- Lacosamide (Vimpat) 200 mg IV (can dose q12 hours)
- Fosphenytoin 20 mg/kg IV load
- Intubation/Sedation

Q & A

- What percentage of the population is expected to have epilepsy?
  - A) 1%
  - B) 5%
  - C) 10%
  - D) 15%
  - E) 25%
Which of these AEDs is safest during pregnancy?

- 1) phenytoin
- 2) phenobarbital
- 3) valproate
- 4) carbamazepine
- 5) lamotrigine

What percent of patients will need more than medications for seizure control?

- 1) 1%
- 2) 5%
- 3) 10%
- 4) 20%
- 5) 30%
• THANK YOU!!!