Chapter 25
Seizures

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Introduction

Seizures are defined as transient occurrences of signs or symptoms related to abnormal excessive or synchronous neuronal activity in the brain. Acute seizures comprise approximately 1% of all emergency department visits. Acutely, most seizures are identified by motor symptoms, such as clonic jerking. The most common seizure emergencies are acute repetitive seizures, an abrupt increase in seizure frequency compared to baseline, and status epilepticus (SE), at least

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30 min of continuous seizure activity or multiple seizures without return to neurological baseline. Convulsive seizures are easily recognized; however nonconvulsive seizures are less clear yet are present in nearly 20% of patients with altered mental status (AMS) who receive electroencephalography (EEG). A period of AMS occurring in the period following a seizure is referred to as a postictal state.

Signs/Symptoms

Seizures have a wide variety of possible manifestations, however common signs and symptoms include:

- Mental status changes (confusion, amnesia, catatonia, psychosis, delirium, agitation, etc.)
- Altered sensation (visual, gustatory, olfactory, etc.)
- Convulsive motor activity (tonic contractures, clonic jerking)

Life-threatening Symptoms/Signs

- Hyperthermia
- Hypertension (though progresses to hypotension as status epilepticus progresses)
- Cardiac arrhythmias
- Rhabdomyolysis

Differential

Most seizures are unprovoked or occur from progression of symptomatic causes; however in hospitalized patients the vast majority of seizures or SE have an acute symptomatic cause. Potential causes include:

- traumatic brain injury
- stroke
- hemorrhage

CNS infections or tumors
metabolic abnormalities (for example, hyponatremia)
alcohol withdrawal
Illicit substances and medications can also lower the seizure threshold
*Epileptic seizures should also be differentiated from psychogenic nonepileptic seizures

Testing

Laboratory studies should be directed but could include:
- Basic metabolic panel, calcium, magnesium, phosphate to rule out metabolic causes
- CBC
- Liver function tests
- Troponin
- Antiepileptic drug (AED) levels, particularly if patient is known to be prescribed an AED such as phenytoin or valproic acid
- HCG level for women of reproductive age

Other studies:
- EEG
- Imaging (must balance the value of imaging with the cost of delaying treatment)
- Lumbar puncture & cerebrospinal fluid analysis if safe to do so and there is suspicion for encephalitis or subarachnoid hemorrhage

Treatment

- Airway management and respiratory support as indicated
- Place patient in left-lateral decubitus position
- Remove any foreign objects from mouth
- Cardiac monitoring
- Correct fluid and electrolyte imbalances
- If hypoglycemic (<80 mg/dL) administer 100 mg of thiamine followed by 20–50 g of dextrose 50% solution

- First line treatment for managing SE: benzodiazepines
  - Lorazepam—0.1 mg/kg at a rate of 2 mg/min
  - Midazolam—0.2 mg/kg, initial dose of 10 mg IM
  - Diazepam—0.2 mg/kg at a rate of 5 mg/min
- Second line treatment: AEDs
  - Phenytoin—20 mg/kg IV loading dose at a rate 50 mg/min; 100 mg every 6–8 h maintenance dose
  - Valproate—20–40 mg/kg loading dose; 4–6 mg/kg every 6 h maintenance
  - Levetiracetam—2000–4000 mg loading dose; 10–15 mg/kg every 12 h maintenance
  - Lacosamide—200–400 mg loading dose; 200–300 mg every 12 h maintenance
- Third line interventions for SE include propofol, pentobarbital, and ketamine

Tool

Potential Causes of Provoked Seizures

Drugs of Abuse	Alcohol
	Stimulants
	Ecstasy
	Phencyclidine (PCP)
	Lysergic acid diethylamide (LSD)
Infection/ Inflammation	Meningitis
	Encephalitis
	Cerebritis
Lesions	Tumors
	Stroke
	Hemorrhage
Systemic	Eclampsia
	Thyrotoxicosis
	Extreme fever

Metabolic Disorders	Hypoglycemia, Hyperglycemia
	Hyponatremia, Hypernatremia
	Hypocalcemia
	Hypomagnesemia
Antibiotics	Penicillins
	Isoniazid
	Rifampin
	Antimalarials
	Metronidazole
Antiarrhythmic agents	Digoxin
	Lidocaine
Antidepressants	Bupropion
	Cyclics
Antipsychotics	Clozapine
	Haloperidol
Pain Medications	Tramadol
	Demerol
	Fentanyl
Miscellaneous Medications	Baclofen
	Phenytoin (at supratherapeutic levels)
	Calcineurin inhibitors (cyclosporine, tacrolimus)
	Lithium
	Chemotherapeutic agents
	Multiple sclerosis medications
Withdrawal from	Opiates
	Alcohol
	AEDs (especially benzodiazepines and barbituates)
Trauma	

References

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