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Status epilepticus

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Seizures are classified by

- **The extent of brain involvement** (generalized vs. focal seizures)
- **The presence or absence of abnormal movements** (convulsive vs. nonconvulsive seizures)
- **The type of movement abnormality** (e.g., tonic, clonic, etc.).

- The movements caused by seizures can be
  - **Tonic** (sustained muscle contraction)
  - **Clonic** (rhythmic movements with a regular amplitude and frequency)
  - **Myoclonic** (irregular, twitchy movements).
- Some movements are familiar (e.g., chewing) and repetitive; these are called **automatisms.**

Generalized Seizures

- arise from synchronous, rhythmic electrical discharges that involve most of the cerebral cortex, and they are always associated with loss of consciousness.
- These seizures typically produce tonic-clonic movements of the extremities, but they can also occur without abnormal movements (generalized nonconvulsive seizures)

Partial Seizures

- can arise from diffuse or localized rhythmic discharges, and the clinical manifestations can vary widely, as demonstrated by the following two examples:

a. Partial complex seizures are nonconvulsive seizures that produce behavioral changes, and can be accompanied by repetitive chewing motions or lip smacking (automatisms). These seizures are a common cause of nonconvulsive status epilepticus, but they do not appear de novo in critically ill patients.

b. Epilepsia partialis continua is a convulsive seizure that is characterized by persistent tonic-clonic movements of the facial and limb muscles on one side of the body.

- **Myoclonus**
- (irregular, jerking movements of the extremities) can occur spontaneously, or in response to painful stimuli or loud noises (startle myoclonus). These movements can be seen in any type of encephalopathy (metabolic, ischemic). Myoclonus is not universally regarded as a seizure because it is not associated with rhythmic discharges on the EEG.

Status epilepticus

- defined as: 5 minutes of continuous seizure activity, or two seizures without an intervening period of consciousness). This can involve any type of seizure, and can be “convulsive” (i.e., associated with abnormal movements) or “nonconvulsive” (i.e., not associated with abnormal movements.
- **Nonconvulsive Status Epilepticus:**

Most cases of nonconvulsive status epilepticus (NSE) involve partial complex seizures (which are not common in ICU patients), but as many as 25% of generalized seizures can be nonconvulsive.

- Generalized NSE is accompanied by loss of consciousness, and can be an occult source of coma in ICU patients).

Predisposing Conditions

- A variety of conditions can promote new-onset seizures in critically ill patients.

the most common predisposing conditions were:

- drug intoxication
- drug withdrawal
- hypoglycemia.
- metabolic encephalopathies (e.g., liver failure, uremia)
- ischemic and traumatic brain injuries
- intracranial mass lesions
- meningoencephalitis.

MANAGEMENT OF STATUS EPILEPTICUS

Aims of management of Status Epilepticus are as follows:

- Termination of Status Epilepticus
- Prevention of Seizure Recurrence
- Management of Precipitating cause
- Management of complications

Approach: Diagnostic workup All patients

- Obtain IV access
- Monitor vital signs (ABC).
- Head CT (appropriate for most cases)

- Labs: blood glucose, CBC, renal function tests, Calcium, Magnesium, electrolytes, AED levels.
  - EEG monitoring
  - Brain MRI
  - Lumbar puncture
  - Toxicology panel (i.e., isoniazid, TCAs, theophylline,cocaine, sympathomimetics, organophosphates, cyclosporine)

- recommendations

1. Fingerstick Blood Glucose: The initial encounter should include a fingerstick blood glucose level. If the blood glucose is <60mg/dl administer IV boluses of D50 (50 mL) and thiamine (100 mg).

2. **Stage 1 Drugs:**

- The most effective drugs for rapid termination of CSE are the benzodiazepines, which are effective in 60–80% of cases.

  a.LORAZEPAM: Intravenous lorazepam (4 mg IV over 2 minutes) is the drug of choice for terminating CSE. The onset of action is<2 min. and the full dose can be repeated after 5–10 minutes, if necessary.

b. MIDAZOLAM: The benefit of midazolam is rapid up-take when given by intramuscular (IM) injection. When IV access is not available, midazolam can be given IM in a dose of 10 mg. The efficacy in terminating CSE is equivalent to IV lorazepam, and the onset of action is only slightly longer than with IV lorazepam (e.g., one study showed a median onset of 3.3 minutes with IM midazolam vs. 1.6 minutes with IV lorazepam)

3. Stage 2 Drugs:

- are used for seizures that are refractory to benzodiazepines, or are likely to recur within 24 hours.
- These drugs include **phenytoin, fosphenytoin, valproic acid, and levetiracetam.**

a. **PHENYTOIN:** The IV dose of phenytoin is 20 mg/kg, or a maximum dose of 1,500 mg.

Phenytoin cannot be infused faster than 50 mg/min because of the risk of cardiac depression and hypotension.

b. FOSPHENYTOIN: Fosphenytoin is a water-soluble phenytoin analogue that produces less cardiac depression, and can be infused three times faster than phenytoin (150 mg/min).

It is as effective as phenytoin, and is preferred because of the reduced risk of hypotension

c. VALPROIC ACID: The IV dose of valproic acid is 40 mg/kg, or a maximum IV dose of 3,000 mg. Although considered equivalent to phenytoin in efficacy. valproic acid is superior to phenytoin for terminating benzo-diazepine-resistant

d. LEVETIRACETAM: The newest anticonvulsant for CSE is levetiracetam which is given in a single dose of 60 mg/kg IV, or a maximum IV dose of 4,500 mg. This drug is also considered equivalent to phenytoin in efficacy.

Table 41.1 Drug Regimens for Status Epilepticus

Drug	Dosing Regimens and Comments
Stage 1 Drugs	
Lorazepam	Dosing: 4 mg IV over 2 min. Repeat in 5–10 min, if necessary.
	Comment: Initial treatment of choice. Onset of action typically <2 min.
Midazolam	Dosing: 10 mg by intramuscular (IM) injection.
	Comment: As effective as IV lorazepam, and preferred when IV access is not available.
Stage 2 Drugs	
Phenytoin	Dosing: 20 mg/kg IV or maximum single IV dose of 1,500 mg.
	Comment: Promotes cardiac depression and hypotension.
Fosphenytoin	Dosing: Same dose as phenytoin.
	Comment: Equal in efficacy to phenytoin, but has a more favorable safety profile.
Valproic Acid	Dosing: 40 mg/kg IV, or maximum single IV dose of 3,000 mg.
	Comment: Considered equivalent to phenytoin in efficacy.
Levetiracetam	Dosing: 60 mg/kg IV, or maximum single IV dose of 4,500 mg.
	Comment: Considered equivalent to phenytoin in efficacy.

Refractory Status Epilepticus

- 10% of patients with CSE are refractory to stage 1 and 2 drugs . The recommended treatment at this point is anesthetic doses of one of the drugs in Table below Guidance from a neurologist (along with continuous electroencephalographic monitoring) is the best option at this stage.

Table 41.2 Drug Regimens for Refractory Status Epilepticus

Drug	Dosing Regimens
Pentobarbital	Load with 5–15 mg/kg IV over one hr, then infuse at 0.5–1 mg/kg/hr. If necessary, increase infusion rate up to 3 mg/kg/hr (maximum rate).
Thiopental	Start with an IV bolus of 3–5 mg/kg, and follow with 1–2 mg/kg every 2–3 min until seizures subside. Then infuse 3–7 mg/kg/hr for the next 24 hrs.
Midazolam	Load with 0.2 mg/kg IV, then infuse at 4–10 mg/kg/hr.
Propofol	Start with IV bolus of 2–3 mg/kg, and use further boluses of 1–2 mg/kg, if needed, until seizure activity subsides. Then infuse at 4–10 mg/kg/hr for 24 hrs.

MCQ TEST

- **1-STATUS EPILEPICUS defined as continuous seizure activity,** or two seizures without an intervening period of consciousness for
  a) 5minutes
  b) 15 minutes'
  c) 20minutes
  d) 1 hour
  e) 3 hour

2- Stage 2 antiepileptic drugs (all true except one)
  a) Phenytoin
  b) Fosphenytoin
  c) valproic acid
  d) levetiracetam.
  e) Lorazepam

- 3- Diagnostic workup for all patient with epilepsy
  a. blood glucose
  b. renal function tests
  c. Calcium,Magnesium,electrolytes,
  d. Antiepileptic drugs level
  e. All the above